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THE FIELD NATURALIST'S QUARTERLY

THE

FIELD NATURALIST'S QUARTERLY

A JOURNAL DEVOTED TO

ZOOLOGY IN ALL ITS BRANCHES, BOTANY, ARCHÆOLOGY,
FOLK-LORE, AND ALL SUBJECTS WORKED BY FIELD
NATURALIST AND KINDRED SOCIETIES

EDITED BY

GERALD R. LEIGHTON, M.D., F.R.S.E.

VOL. II.

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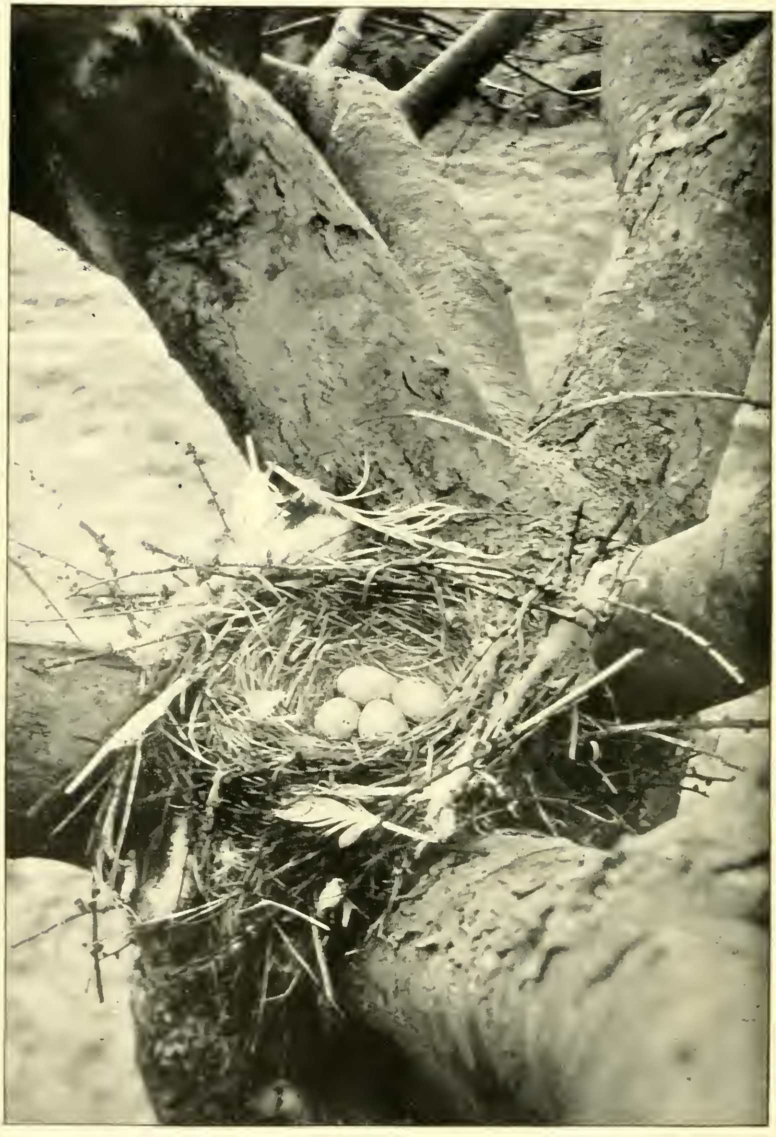

Photo by T. Dewhurst.

NEST AND EGGS OF MISSEL-THRUSH.

The Field Naturalist's Quarterly

Vol. II. FEBRUARY 1903. No. 5.

Editorials.

A year ago we stated in this column what were to be the main aims and objects of this journal. With the present issue we enter upon volume ii., concerning the prospective contents of which we wish to say a word. But before speaking of the future we desire in the first place to express our most grateful thanks to all those who in 1902 did so much to assist in launching the 'F. N. Q.'—as this paper has come to be known—on what promises to be a prosperous voyage. The only thing wanted to stiffen the determination of the editor and his colleagues to found a journal peculiarly devoted to the subjects in which field naturalists take an interest, was the encouragement and help of those who have the best interests of field clubs and societies at heart. That help and encouragement has been freely offered from the very beginning, but has been specially marked during the last few months. We desire, therefore, to thank most sincerely all those who have contributed to our columns, who have assisted in making the journal known amongst those for whom it is particularly intended, and who have made suggestions for the improvement of the paper.

Specially are our thanks due to many secretaries of field clubs in various parts of the kingdom. Wherever possible we have fallen in with suggestions offered, and shall be glad to consider any in the future. Our sole aim is to provide our readers with the best matter we can obtain from their own particular point of view. From many letters received it would appear that the 'F. N. Q.' is supplying a want, and with increasing support it will be our endeavour to supply that want still more satisfactorily.

As regards the volume now commencing, it will differ in some respects from volume i., though the main lines will remain unaltered. As before, a certain proportion of articles will bear on the season of issue, a feature which has been generally approved. Of regular contributors, F. G. Aflalo continues his Fish articles, Mr Bird his on the various aspects of Broadland Fauna, the editor his Reptile Studies, Mr Minos his Archæology series, Mr Westell his Seasonal subjects, Mr Morley his Entomology; whilst the Library, Correspondence, and Field Club columns will be on the same lines as hitherto. Of new features, one is initiated in the present issue—namely, the first instalment of our "Record of Species observed," the objects of which were explained in our last. It is hoped that this column will prove valuable to both writers and readers. A more important venture is the series of articles on "British Field Zoology," the introduction to which appears with this number. This venture is the direct result of the editorial which appeared in our last. It was there pointed out that general scientific principles did not receive sufficient attention in field club work. Correspondence since received from both secretaries and members of such societies proves that our contention is recognised to be true, and that any assistance in that direction will be cordially welcomed. The fault is that field naturalists are shown and taught mainly details of species; the want is a continuous picture of the whole of a subject. Text-books are too exclusively morphological for the average member of a field club, and most of them assume too great a knowledge to begin with. We have already endeavoured to overcome this difficulty in Archæology, Mr Minos in his articles having begun with a general description of Norman work before going on—as he does in this issue

—to special examples of it. Botany will be similarly treated soon.

For the benefit of those who are new to field work, and who are on the threshold of scientific study, we intend to carry out the same plan in the domain of British Zoology. These articles will aim at giving a simple yet scientific view of the subject of Zoology, looked at mainly from the standpoint of field work, as opposed to that of laboratory work. There is no question of the respective merits of the two points of view; it simply is that they are different, and are studied by different classes of the community. The ideal naturalist is the man who spends one-half of his time and energy in observing animals in their natural surroundings and the other half in the laboratory with his scalpel and microscope. Unfortunately it is not given to many to be able to satisfactorily combine the two methods. Our duty in the matter is to try and help the outdoor worker to a scientific comprehension of what he sees. The articles will be written by field naturalists who have devoted special attention to certain groups of animals, and will be illustrated. The examples of the various Classes, Orders, &c., will be taken from British forms exclusively, those most readily obtainable being preferred. It will be understood that these articles are for beginners in field work, and we are sure that advanced workers will not grudge the space given to them, and may even derive some benefit themselves in once more reading some great scientific truths although clad in the simplest language.

For the rest we are glad to find that our Correspondence columns are becoming more widely used, and should welcome any extension in this direction. There is ample evidence that the care taken in the reviews of books in the Library column has been much appreciated by our readers who wish to add to their own libraries; and the Competition for Young Naturalists has produced some most excellent essays, the rewards for which will, we trust, stimulate the juniors to still more serious study.

Those of our readers who as yet have not identified themselves with any field club or society we would urge to do so, if there be such an institution in their locality; and further, we would urge them not merely to be content with paying an annual subscription to their club, but to support the work and the officials by every means in their power,—to be, in fact, in the best sense of the word, active members. By so doing they will be—without seeking it—amply rewarded by the ever-widening interest and knowledge obtained in the various subjects brought under their notice, whilst at the same time they will be taking their share in dispersing that knowledge amongst others.

* * * * *

By a curious coincidence we have received within a few days of each other two accounts of members of the Weasel tribe attacking human beings. One comes from Monmouthshire, the other from Aberdeenshire. Appropriately enough Mr Bevir writes on this group of mammals in another part of this issue. We shall be glad to hear from other correspondents who may have experienced similar encounters, and to publish their statements.

* * * * *

The article entitled "How the Animals Die" in this number forms the last chapter of Mr Long's most striking book 'School of the Woods.' It is published here by special permission and arrangement with the publishers, Messrs Ginn & Co., to whom we are indebted for their kindness in allowing us to reproduce it. We have noticed this book elsewhere, but the article in question will give our readers a far better insight into Mr Long's method of dealing with the subject of animals in nature than any review can do.

* * * * *

Owing to great pressure upon our space several articles which should have appeared now are held over to our next issue. In that number "Reptile Studies" will be resumed, the subject to be dealt with being "Snake-Venom, and Immunity from Snake-Bite." In this article we shall have something to say about the controversy which has recently been raging in the press concerning the Mongoose and its snake-killing propensities.

* * * * *

The longevity of some of our domestic animals is much greater—in the absence of accident—than many are aware of. A correspondent recently wrote to the 'Edinburgh Evening News' to record the death of a patriarchal cat. 'Tommy' had been in the family for twenty years and ten months: from April 1882 until January 1903. Truly a good old age.

How the Animals Die.

By William J. Long.

The scream of an eagle—a rare sound in the summer wilderness—brought me hurrying out of my *commoosie*[1] to know what had caused Cheplahgan[2] to break the silence. He was poised over his mountain-top at an enormous altitude, wheeling in small erratic circles, like an eaglet learning to use the wind under his broad wings, and anon sending his wild cry out over the startled woods.

Clearly something was wrong with Cheplahgan. This was no eaglet calling aloud to his unknown mate, or trying for the first time the eagle's wonderful spiral flight; neither was it one of a pair of the royal birds that I had been watching and following for weeks, whose nest and little ones I had found at last on a distant crag. Occasionally, as I followed them, I had glimpses of another eagle, a huge, solitary old fellow without a mate, whose life had been a puzzle and a mystery to me all summer. It was he who was now crying aloud over the high mountain, where I had often seen him looking out with quiet eyes over the wide splendid domain that he ruled no longer, but had given over to younger eagles,—his nestlings, perhaps,—only claiming for himself the right to stay and hunt where he and his vanished mate had so long held sway; for most birds and beasts of prey have their own hunting-grounds, and, until they give them up, none other goes a-poaching there. It was this that had chiefly puzzled me all summer. Now I ran to a point and sat down quietly against a weather-worn root that blended with the grey of my jacket, and focussed my glasses steadily on Cheplahgan to see what he would do.

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[1] A little shelter of boughs and bark.

[2] The bald eagle (Indian name).

Soon the erratic circles narrowed to a centre, about which the great eagle turned as on a pivot; the wild cry was hushed, and he spread his wings wide and stiff, as an eagle does when resting on the air. For several minutes I could see no motion; he seemed just a tiny dark line drawn across the infinite blue background. Then the line grew longer, heavier; and I knew that he was coming down straight towards me.

Lower and lower he came, slanting slowly down in a long incline by imperceptible degrees, without a quiver of his wide-set wings. Lower still and nearer, till I saw with wonder that his head, instead of being carried eagle fashion, in a perfect line with body and tail, drooped forward as if it were heavy. Straight over the point he sailed, so near that I heard the faint crackle of his pinions, like the rustle of heavy silk. The head drooped lower still; the fierce, wild eyes were half closed as he passed. Only once did he veer slightly, to escape a tall stub that thrust its naked bulk above the woods athwart his path. Then with rigid wings he crossed the bay below the point, still slanting gently down to earth, and vanished silently into the drooping arms of the dark woods beyond.

Clearly something was wrong with Cheplahgan. Such an eagle's flight was never seen before. I marked the spot where he disappeared, between two giant trees, and followed swiftly in my canoe. Just within the fringe of forest I found him, resting peacefully for the first time on mother earth, his head lying across the moss-cushioned root of an old cedar, his wings outstretched among the cool green ferns—dead.

Behind my tent in the wilderness, last summer, was a little spring. I used to go there often, not to drink, but just to sit beside it awhile and grow quiet, watching its cool waters bubble up out of the dark earth amid dancing pebbles to steal away among the ferns and mosses on its errand of unchanging mercy. Now and then, as I watched, the little wild things would hear the low tinkle of invitation to all who were athirst, and would come swiftly to drink. Seeing me, they would draw back among the ferns to watch and listen; but the little rivulet tinkled away unchanged, and they always came back at last, taking me shyly for their friend because I sat beside their spring.

One day when I came a little wood-warbler was sitting on a frond of evergreen that hung over the spring as if to protect it. For several days I had noticed him there, resting or flitting silently about the underbrush. He rarely drank, but seemed to be there, as I was, just because he loved the place. He was old and alone; the dark feathers of his head were streaked with grey, and his feet showed the wrinkled scales that age always brings to the birds. As if he had learned the gentleness of age, he seemed to have no fear, barely moving aside as I approached, and at times coming close beside me as I looked into his spring. To-day he was quieter than usual: when I stretched out my hand to take him he made no resistance, but settled down quietly on my finger and closed his eyes. For a half-hour or more he sat there contentedly, blinking sleepily now and then, and opening his eyes wide when I brought him a drop of water on the tip of my finger. As twilight came on, and all the voices of the wood were hushed, I put him back on the evergreen frond, where he nodded off to sleep before I went away.

Next morning he was closer to the friendly spring, on a lower branch of the big evergreen. Again he nestled down in my hand and drank gratefully the drop from my finger-tip. At twilight I found him hanging head down from a spruce-root, his feet clinched in a hold that would never loosen, his bill just touching the life-giving water. He had fallen asleep there, in peace, by the spring that he had known and loved all his life, and whose waters welled up to his lips and held his image in their heart to the last moment.

How do the animals die?—quietly, peacefully, nine-tenths of them, as the eagle died in his own free element, and the little wood-warbler by the spring he loved. For these two are but types of the death that goes on in the woods continually. The only exception is in this: that they were seen by too inquisitive eyes. The vast majority steal away into the solitudes they love and lay them down unseen, where the leaves shall presently cover them from the sight of friends and enemies alike.

We rarely discover them at such times, for the instinct of the animal is to go away as far as possible into the deepest coverts. We see only the exceptional cases, the quail in the hawk's grip, the squirrel limp and quiet under the paw of cat or weasel; but the unnumbered multitudes that choose their own place and close their eyes for the last time, as peacefully as ever they lay down to sleep, are hidden from our sight.

There is a curious animal trait which may account for this, and also explain why we have such curious, foolish conceptions of animal death as a tragic, violent thing. All animals and birds have a strong distrust and antipathy for any queerness or irregularity among their own kind. Except in rare cases, no animals or birds will tolerate any cripple or deformed or sickly member among them. They set upon him fiercely and drive him away. So when an animal, grown old and feeble, feels the queerness of some new thing stealing upon him, he slips away, in obedience to a law of protection that he has noted all his life, and, knowing no such thing as death, thinks he is but escaping discomfort when he lies down in hiding for the last time.

A score of times, with both wild and domestic animals, I have watched this and wondered. Sometimes it is entirely unconscious, as with an old bear that I found one summer who had laid him down for his winter sleep under the roots, as usual, but did not waken when the snows were gone and the spring sun called him cheerily. Sometimes it is a triumphant sense of cunning, as with certain ducks that, when wounded, dive and grasp a root under water, and die there, thinking how perfectly they escape their enemies. Sometimes it is a faint unknown instinct that calls them they know not whither, as with the caribou, many of whom go far away to a spot they have never seen, where generations of their ancestors have preceded them, and there lie down with the larches swaying above them gently, wondering why they are so sleepy, and why they care not for good moss and water. And sometimes it is but a blind impulse to get away, as many birds fly straight out to sea till they can go no farther, and fold their tired wings and sleep ere the ocean touches them.

One day you may see your canary fluttering his unused wings ceaselessly against the bars of his cage, where he lived so long content. Were you wise, you would open the door; for a call, stronger far than your artificial relations, is bidding him come—the call of his forgotten ancestors. Next day he lies dead on the floor of his cage, and there is left for him only a burial more artificial than his poor life.

"But," some reader objects, "what about the catastrophes, the tragedies?" There may be a few, possibly, if you see with your imagination rather than with your eyes; but they are rarer far than human catastrophes. And as the vast majority of mankind die, not by earthquake or famine, but peacefully on their beds, so the vast majority of wild creatures die quietly in beds of their own choosing. Except where man steps in and interferes with the natural order of things, or brutally kills a brooding or nursing mother, Nature knows no tragedies. A partridge falls under the owl's swoop. That is bad for the partridge,—who is, however, almost invariably one of the weak or foolish ones who have not learned to be obedient with his brethren,—but there are two young owls up in the tree yonder who will rejoice and be glad at the good dinner brought home to them by a careful and loving mother.

As a rule, Nature, as well as man, protects her brooding mother, on whom helpless lives depend, with infinite care and cunning. Even the fox cannot smell them at such times, though he pass close by. But should the mother fall,—even here we have let our human imagination run away with us,—the young do not starve to death, as we imagine pitifully. They cry out for their dinner; the mother is not near to hush them, to tell them that silence is the law of the woods for helpless things. They cry again; the crow or the weasel hears, and there is a speedy end to the family without delay or suffering. This is the way of the woods.

There are violent deaths, to be sure; but these are usually the most painless and merciful. A deer goes down under the spring of a panther, watching above the runways. We imagine that to be a fearful death, and painters have depicted it in the colours of agony. As a matter of fact there is no pain whatever. Livingstone, who lay under the paw of a lion, with his shoulder crushed and his arm gashed with seams whose scars he carried to his grave, felt no pain and did not even know that he was hurt. He was the first to call attention to the fact that the rush and spring of a savage animal brings a kind of merciful numbness that kills pain perfectly, and seems also to take away all feeling and volition; so that one is glad simply to lie still—his only hope, by the way, if he is to escape. If this is true of men, it is ten times more so of the animals, which have none of our nervousness or imagination.

There are many other things which point to the same comfortable conclusion. Soldiers in the rush of a charge or the run of a retreat are often mortally hurt without knowing it till they faint and fall an hour later. Every one has seen a mouse under the cat's paw, and the toad in the jaws of a snake, and knows that, so far as the stricken creatures are concerned, there is no suggestion there of death or suffering. And I have seen larger creatures—rabbits and grouse and deer—lying passive under the talon or claw that crushed them, and could only wonder at Nature's mercifulness. Death was not hard but kind, and covered over with a vague unreality that hid all meaning from the animals' eyes and made them wonder what was happening.

Sometimes the animals die of cold. I have occasionally found, on bitter mornings, owls and crows, and little birds, hanging each by one claw to a branch dead and frozen. That is also a merciful and painless ending. I have been lost in the woods in winter. I have felt the delicious languor of the cold, the soft enfolding arms of the snow that beckoned restfully as twilight fell, when the hush was on the woods and human muscles could act no longer. And that is a gentle way to die when the time comes.

Sometimes the animals die of hunger, when an ice-storm covers all their feeding-grounds. That also, as any one knows who has gone days without food, is far more merciful than any sickness. Long before pain comes, a dozy lassitude blunts the edges of all feeling. Sometimes it is fire or flood; but in that case the creature runs away, with a confidence that he always feels in his legs or wings, till the end comes swift and sure. Those that escape huddle together in a safe spot, forgetting natural enmities and all things else save a great wonder of what has come to pass. In short, unless the animals are to live always and become a nuisance or a danger by their increase, Nature is kind, even in her sterner moods, in taking care that death comes to all her creatures without pain or terror. And what is true of the animals was true of man till he sought out many inventions to make sickness intolerable and death an enemy.

All these latter cases, it is well to remember, are the striking variations, not the rule, of the woods. The vast majority of animals go away quietly when their time comes; and their death is not recorded because man has eyes only for exceptions. He desires a miracle, but overlooks the sunset. Something calls the creature away from his daily round; age or natural disease touches him gently in a way that he has not felt before. He steals away, obeying the old warning instinct of his kind, and picks out a spot where they shall not find him till he is well again. The brook sings on its way to the sea; the waters lap and tinkle on the pebbles as the breeze rocks them; the wind is crooning in the pines —the old, sweet lullaby that he heard when his ears first opened to the harmony of the world. The shadows lengthen; the twilight deepens; his eyes grow drowsy; he falls asleep. And his last conscious thought, since he knows no death, is that he will waken in the morning when the light calls him.

Animal Colouring in Winter.

By Frank E. Beddard, M.A., F.R.S., Prosector to the Zoological Society of London.

It is possibly—even probably—the general opinion among those who are not specially instructed in the matter that the remarkable change to white, which many animals inhabiting the arctic regions display at the beginning of winter, is a phenomenon *sui generis*, and without even parallel. Nevertheless, it cannot be too strongly insisted upon that this assumption of a white pelage, or of white feathers, is merely an extreme case of a change which is general, and indeed nearly universal, among mammals and birds. Quite apart from the putting on of a thicker coat in winter, as exemplified by the Camel, the Bison, and other animals which are dwellers in temperate climates, there is frequently a distinct change of colour at that season, which is not necessarily a change to white. The change may, in fact, be in the direction of a darker hue: the Snow Bunting, for instance, has not so much white among its feathers in the winter as in the summer. Generally, however, the paler hues—if there is a difference of the kind between winter and summer coat—are peculiar to the winter. Thus the Reindeer is paler in the colder season than in the summer; the Grey Phalarope in summer is tinged with various shades of brown, while in the winter it is white and grey and quite gull-like in hue, a fact which is incidentally of some importance in considering the very near relationship which the Limicoline birds most unquestionably bear to the Gulls. Mr Keeler, the author of an important treatise upon the colours of American birds, which contains many reflections of value upon the general problems to which the facts which he has industriously collected give rise, points out that the American Dipper (*Cinclus mexicanus*) has a white breast in winter.

The extreme, then, of these seasonal changes in colour are to be seen in certain denizens of the polar regions, and even of the more temperate countries bordering upon these, where there is not only a paling of the summer hues in winter, but an actual change to a snow-white plan of colouration which differs from albinism, superficially at any rate, in the fact that the pigment is not entirely lost, but is retained in various parts of the body, such as the snout and eyes in the "White Fox," and the tip of the tail in the Stoat or Ermine. Furthermore, the winter pelage is sometimes remote from albinism in other ways. It is probable that the white colour of the hairs is not always real; it is at least sometimes apparent, and due to masking of pigment still present by bubbles of gas within the hairs. Before considering more at length the causes which may be the efficient ones in producing this singular blanching in the fur or feathers of many birds and mammals at the commencement of winter, it is desirable to cast a glance over the actual facts ascertainable. The most salient fact, perhaps, concerning the matter is the apparent capriciousness of this change. It is by no means every animal which passes its entire life in the polar regions, or at least the more boreal regions of Europe, Asia, and America, that undergoes this marked seasonal metamorphosis. While the Arctic Fox and the Polar Hare change to white as winter approaches, the Musk Ox and the Glutton show no such changes. The "Ptarmigans" of both Europe and America become white in winter, but not so their close ally the Red Grouse of Scotland. The Stoat furnishes royal ermine in the winter, but the Weasel, according to Mr de Winton, is only "paler in colour in winter." One Lemming turns white seasonally, another does not. Further than this, there is some capriciousness seen among individuals. It is not every "Blue" Fox which becomes a "White" Fox in winter. Again, the habit of this extreme seasonal change is generally lost on removal to a milder climate. Thus the Polar Hare does not assume its white fur in Ireland; and many years ago Daubenton kept a captive Ermine in order to study the changes which accompanied the moult to the brown pelage of summer, which was duly accomplished. But that eminent naturalist, though he kept the Stoat for upwards of two years, "did not enjoy the satisfaction of seeing it resume its former whiteness." This lack of sensitiveness he justly (in our opinion) attributed to the milder climate of France.

Of these facts the explanations have been various. Concerning some of these attempted explanations we may perhaps be allowed to quote the "ingenious" Mr John Ray, and observe with him that "they need no other confutation than *ha, ha, ha!*" Thus the ancients gravely held that the Polar Hare becomes white on a diet of snow. And Olaus Magnus, the learned and, at times, acute historian of the Northern peoples, addressed himself to a work of supererogation in proving that the Hare in winter eats the bark of trees.

"Certum est eos . . . vesci corticibus arborum pinei, quercini, tremulei, ac populei generis," remarks the archbishop with unnecessary detail. But notwithstanding this flash of reason the same authority pledges himself so far as to assert that he saw ("*vidi*") Mice which fed upon white sugar become white, and alter the colour when they ceased to feed upon that substance! This is a curious anticipation of later cayenne-pepper-coloured Canaries and white fowls, and none the less so on account of its obvious falsity. We may fairly dismiss the colour theory in its grosser aspect. But the question of food and whiteness has another side which does demand some careful thinking over.

White is the hue of senility; and it has been pointed out that white is not infrequent as a colour among species which are believed on other grounds to be on the wane. The opposite, black, is, as an opposite would naturally be, a sign of the precise converse of senility. The Raven, and the Crow tribe generally, have been held (for example, by Prof. Newton) to be the culmination of bird structure, and black is at the same time one of the rarest of colours, and found as the extreme term in a series commencing with paler hues. If white is evidence of decay and degeneration of species, it is even more probable that the absence of colour is to be at least occasionally looked upon as the expression of imperfect nutrition, as, for instance, in old age. The animals of the boreal regions must have in many cases an extremely severe struggle for existence, not so much in relation to each other as to external nature, who is in these regions hard and cold. Insufficient diet would be most marked in winter, and a corresponding diminished output of pigmentary substances, the waste products of the body, increasing with the increase of metabolism, would be expected. The view, however, that at present seems to command most adherents is that the change to white in winter—being of direct utility—has been brought about by natural selection. It does seem at first sight as if there were at any rate much to be said for this view. Even the exceptions seem to be in its favour. As has been pointed out, the Musk Ox does not change to white at all; but there would not appear to be great advantage in its doing so. The chief object of a gregarious species is that the members of the herd should keep together, and thus avoid any "prying pard," or, more accurately, any ravenous and marauding Polar Bear, who might be on the look-out for a strayed individual, but who would not be capable of confronting the whole herd of horned beasts. Thus recognition is more essential than concealment from foes. The Raven again, strong on the wing and in the bill, is capable of holding his own against such small carnivora as the Ermine, who might attempt to seize him when upon the ground. The Glutton, too, is mainly a carrion-feeder, and thus needs no duplicity of colour to aid in the cautious advance upon suspicious herbivores; nor does it fear as enemies any of the larger carnivorous beasts which live in the tracts of country which it inhabits.

But, after all, it is highly difficult to formulate any positive statements as to such advantages. Does the White Ptarmigan really elude the Arctic Fox? Is it not probable that the latter has a keen scent, and would not be deluded by the most perfect resemblance to a snowy environment? As for the Polar Bear, it has been pointed out again and again that its white hue is far purer in the young Bear than in the adult, and that old Bears have received the nickname of "Old Brownie" by reason of their distinctly brownish tint, which increases with age. Then, too, the perfectly just criticism has been put forward, that at the first the change to white in the winter, or to a complete white coat in the case of such animals as the Snowy Owl and the Polar Bear, which are white or nearly so all the year round, must have been abrupt and final to be of any use. Probabilities at least are against this; and we have a case in point in the Virginian Eagle Owl, which gets whiter as we approach the north. Piebaldness would be more fatal on a protective theory than, or certainly as fatal as, a marked and dark colouration. There seems to be no way out of the assumption that we are not to use that "universal key," natural selection, to explain arctic lack of colouration. The fact that the direct stimulus of the cold is requisite to produce the change is significant. Had the habit, if we so term it, been engrained into the nature of the beast by countless generations of rigidly selected individuals, the change would at least for a time continue in the descendants who were removed to milder climates. The case of the Raven, it may be observed, is hardly so strong an example of the exception proving the rule as has been thought. The Raven is not a purely arctic bird: that it occurs in the most northerly climes is a fact; but it is a wanderer to those polar regions from the south, and it does not change in hue, a fact which is at least as much in harmony with the view that continued dwelling in icy conditions is itself in some cases responsible for the white coat of winter or of the whole year. Very significant, too, is the case of the Virginian Eagle Owl; and Mr Keeler, to whom reference has already been made, comments upon the large amount of white in the North American birds generally. In fact, there is something to be said in favour of looking upon this seasonal change, exemplified in so many of the inhabitants of polar regions, as an extreme development of the paleness of hue, a partial blanching, which is characteristic of many species which are inhabitants of dry, not necessarily cold, though frequently also at least temperate, regions. This fits in well with the capriciousness of the change in species and in individuals: one species or some individuals are more sensitive than others. If this be the *vera causa* of the winter change, the possibility of the same change being in itself useful is not thereby excluded. But that is a very different matter from attributing the change to selection. And in any case, as it appears to me, utility has yet to be proved; nor will it be proved by ingenious reflections, suggestions, and assertions emanating from occupants of study-chairs. What is to be desired is more study of the actual pigmentary changes, and experimentation as to the effects of heat and cold upon these pigments, and upon the complex physiological questions involved.

The Angler's Winter.

By F. G. Aflalo, F.R.G.S., F.Z.S.

The angler-naturalist, though he does not, like his brother of the gun, enjoy his best sport during the short days when there is frost on the banks and ice in the shallows, is not by any means idle in playtime, so long as he has no rooted objection to taking his pleasure in cold weather. In sea and river alike there is plenty to be done. For me, I confess it, the summer's fishing has all the charm; the winter's sport is, save for a day now and again to keep one's hand in, a barren pastime indeed. Yet there are many who angle more in winter than in the warmer months; and for those sea-anglers, for instance, who fish at Deal and other resorts not a great distance from town, the Cod and Whiting of winter are more likely to prove attractive than the more uncertain Bass and Grey Mullet of July and August.

There used to be a notion that the greater number of our sea-fish left the bays and beaches as cold weather drew on and went off into the deeper water. As cold water is heavier than warm, I never quite understood by what perversion of the most elementary physical laws the fish are supposed to find a more genial temperature at the greater depths. It is quite obvious that the deeper water will long remain unaffected by those local disturbances that ruffle the surface and perhaps render it untenable for fish life, but why it should be accounted warmer is one of those things that, as Dundreary said, no fellow can understand. It is also clear that, as the majority of young fishes hatch out in the warm season of the year, then also will the inshore waters, the very nursery of fish life, hold more evidence of living creatures. Yet I venture to say that there are, if anything, more food fishes of useful size within a mile of our coasts between October and the turn of the year than at any other period. Each season, of course, has its types: to the summer its Pilchards and Mackerel and Bass; to the winter its Herrings and Sprats and Whiting; with Flat

Fish and Gurnards at all times. The inclement weather, with those terrible winter gales that have lately ravaged our coasts, more even than in earlier years when the winters were much harder than they are now, may also interfere with the operations of the nets, particularly in shallow water; and the total catch in winter will therefore be no gauge of the actual abundance of fish.

There are those who tenaciously hold to the opinion that the Bass, even the larger individuals, are as plentiful in our estuaries in winter as in summer. Keeping always the open scientific mind on such subjects, I am by no means in a position to deny the statement. All I can say is that the Sprat and Herring nets rarely, if ever, take them, though worked on all their favourite summer grounds, and no one tries to catch them on the hook, as the best baits, such as Sand-Eels, are not to be had. Personally, I should not be surprised if the Bass are not in our estuaries at all between, say, the last week of October and the middle of April. I have caught small Bass in the western Mediterranean during the first week of March; but the thermometer is higher in those latitudes than on our coasts, and, for all I know to the contrary, Bass may hug the beaches of Tangier and the jetties of Marseilles throughout the year.

With the fishes of our rivers the winter brings its changes as much as with those of the salt water, perhaps even more. A few favourite Thames fish are at their best in winter. Enthusiasts regard winter chub-fishing, I believe, with a hook bait of pith and groundbait of brains, as among their finest chances of real sport. Pike-fishing, too, is absolutely at its best in the coldest months of the year. There are pike-fishers so keen that they swathe the rod rings in oiled wool to prevent the freezing wet line sticking, and they will fish, and catch specimen Pike too, between the miniature ice-floes and with their bait-kettle below zero. The famous and somewhat apocryphal Thames Trout, too, which almost rival those of the Rotorua district in New Zealand, are also taken in hard weather, and one authority has pointed out that the angler equipped with lively Bleak for bait stands a very first-rate chance on a cold April day when there are no Bleak in the weir-pools, for the Bleak repair under such conditions to the deeper water. Perhaps, however, the Trout ought hardly to be named with the angler's winter fish, since, to be accurate, the close time during which it enjoys the protection of the law covers the entire period (September to the end of March) commonly known as winter. The Roach, a pet fish with the bank-anglers of Thames and Lea, is also at its best in the winter months, a plump, hard-fighting fish, very different from the flabby fellow he was in the hot weather.

The most remarkable exception to this prevalent excellence of river-fish in the winter months is found in that handsome creature, the Barbel. I believe it is a fact that Barbel are never caught in winter. Whether they feed, perhaps, on some natural food that the angler has not yet determined and tried on the hook is an open question. It is hardly to be supposed that, like some reptiles, they fast for half the year. On the other hand, though few people bait their swims and fish for Barbel when there is ice on the water, there are plenty of hooks baited with worms every week-end in the Thames between Oxford and London, and it is hardly credible that not a single Barbel would ever be hooked in cold weather unless the species underwent some sort of torpid retirement, or at any rate neglected all ordinary kinds of food at that season. I have not done any fresh-water coarse-fishing for years, and I may be in error, but if any reader of the 'Field Naturalist's Quarterly' is in the habit of catching winter Barbel I shall be very grateful for particulars of the bait and conditions. The place I need not know, as I am no enthusiast at such work, and my curiosity is scientific and not sporting.

No reference to winter fishes from the standpoint of the angler would be complete without alluding to the king of them all, the Salmon, fishing for which opens during the first week of February on such rivers as the Hampshire Avon and Stour, the Sussex Adur, and the Highland Tay. The Teign, on the other hand, by the banks of which I have thought out these few notes, reposes for a further month, the nets not being brought out until the second day in March. It has always struck me that the Salmon gets an all too short close time. If we were quite sure that the fish returned to the same river, there would be no cause for complaint; for local fishery boards and committees fix, as prescribed by law, a minimum number of days of rest—ninety-two for rods in England and one hundred and sixty-eight for nets in Scotland.

Thus, if it were only an ascertained fact that every Salmon returns to the same river, as Swallows are said to return to the same eaves, year after year, we should be quite sure that a sufficient close time was allowed, because, as I say, each board appoints a close time of at any rate three or four months, generally indeed of longer duration, and the fish would have time to recuperate and to recoup. But who knows that a Fowey fish, for instance, does not find its way back to the Avon and Stour, the joint-estuary of which is only a couple of hundred miles or so east of the Cornish stream? And, if such should be the case, a poor Salmon might only have been grazed by a hook in the Fowey on the last day of November to encounter the nets of the Hampshire licensees again on the second day of the following February, having thus enjoyed immunity for only two months, a totally inadequate rest. It might, of course, be argued that fish which went down the Fowey in November would not again be in condition to ascend the Avon and Stour in February. Such is probably the correct view, yet the position has none the less an unsatisfactory appearance. I do not exactly see how this possible misfortune is to be remedied, for, as a matter of fact, it would be extremely difficult to appoint a uniform close time for all the rivers of the kingdom that should take into account their varied physical conditions, and this for biological reasons quite apart from the administrative confusion in local bodies with control. Yet it is sometimes of use to point out a grievance in the hope that readier brains may devise the remedy, and with this I must rest content.

What becomes of fish in winter is always a puzzle to the angler, and I was much struck by a suggestion made in 'Land and Water' of January 3, by J. Berryman, to the effect that Trout may burrow in the fine gravel of the river-bed. This observer saw a Trout actually so engaged, and he submitted in his account of the episode that the spring leanness of Trout could not be entirely attributed to spawning, but must also be the result of starvation.

One of these days, no doubt, when the seas and oceans have been more thoroughly submitted to scientific investigation, we shall know even more about the migrations of fishes than we now know about those of birds. At present, however, our minds are in a darkness scarcely less profound than that of the uttermost depths of the sea.

Notes on the Weasel Tribe (*Mustelidæ*).

By J. L. Bevir, M.A.

"To stink like a fitcher" was a saying with which I was very familiar as a boy, and I think I may take it as the text of the few rambling remarks that I wish to make. There is no doubt that the terms Fitchet, Fitchel, and Fitchew some centuries ago were applied indiscriminately to all animals of the Weasel tribe. The word is derived from the German *Visse*, *Fisse*, or *Vitche*, which connoted a small animal with an offensive smell. In Shakspear ("Troilus and Cressida," v. 1) Thersites says he would rather be "an owl, a cat, or a fitchew than Menelaus." The poet uses it again in "Othello" (iv. 1) of Bianca, where lewdness would seem to be implied.

Passing from that to Walton's 'Compleat Angler,' Venator says, "And if I may descend to lower game, what pleasure is it sometimes with gins to betray the very vermin of the earth! as, namely, the fitchet, the fulimart, the ferret, the polecat, the mouldwarp." Here one seems to be arriving at a scientific distinction of species; but when one comes to analyse the terms, one is left even more than ever in the dark, very much as one is after reading that charming chapter in Mr Long's book, 'Beasts of the Field,' on Kagax the destroyer, which he calls simply a weasel. But was he? He had all the lust for killing for killing's sake which is characteristic of the whole tribe, but from what he slew, I ha' me doots he was a weasel as we know him.

I would therefore start afresh and try and differentiate the

English specimens which have much in common, and would arrange them according to their size, and consequently to a certain extent, but only to a certain extent, according to their prey.

First I should place the Polecat, whose name apparently was originally the Polish Cat (*Mustela putorius*), the Putois of Buffon, the Stinker *par excellence*. His measurement is 1 foot 5 inches. He differs from the others in coat, which is very dark brown above, somewhat yellow beneath; he has a certain amount of white about his head, especially in the nozzle. He is a very fierce and bold beast. I have had two. The first was a very fine fellow, and lived with a ferret. (I may remark in passing that I think Sir Izaak was wrong in speaking of the Ferret as indigenous. I believe it to be of southern origin, as its inability to stand cold seems to imply.) I tried the Polecat as a ratter: if he could get down the hole he was very efficacious, but if he could not he became angry, and I can see him now pursuing the gardener round the greenhouse. The polecat is the most destructive of the clan, and will do much mischief if he can get into a chicken-run or among game. Bell describes him as the Fitchet Weasel, with the second name Foulimart, or foul Marten, which is probably sound, for his size and colour would lead many to think that he was a Marten rather than a Weasel. Talking the other day to my mother, who is over eighty, about the fashion in furs, she said that every one who could afford it, when she was young, wore a tippet of Marten, though there was an inferior fur called Fitch, which I think must have been Polecat.

That brings us to the Stoat or Stout (*Mustela erminea*), which for trade purposes is known as Ermine. Its average length is about 10 inches. It is easily recognisable. In its summer coat it is reddish-brown above, white below, with a black tail. In northern countries it goes almost snow-white in winter, though there is at times a dash of yellow about it. The arrangement of its skin, with the tail hung in the middle, gives us the ermine of heraldry, and the fur which of late has been particularly fashionable. This change into white depends very much on temperature, and in the south of England it is rare. Taking records, as I could gather in the

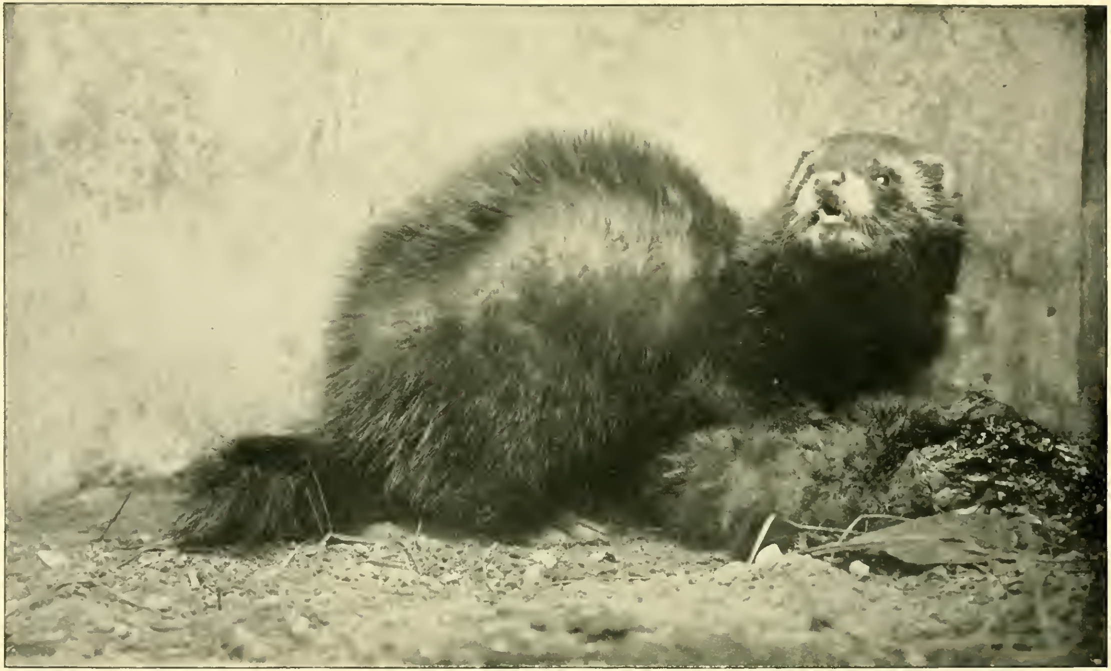

Photo by Douglas English. *Copyright F. N. Q.*

THE POLECAT.

British Isles, they vary, but few Stoats in England, I believe, go completely white.

He is the merriest of little beasts, and delights in gambolling. Even when pursuing his prey he will give vent to the wildest of antics. I know him best in Norway, where I have often watched him at play. He is very fond of running about near the river, very angry when I point my rod at him, and if I trouble him much he takes freely to the river. An old fisherman has told me that he has twice met him in the middle of the narrow fjord swimming, and that on offering him an oar he climbed into the boat. One day up on Vexel Vand, my gillie, Ivar Kriken, found a female stoat who had torn up a dry cow-pat, and was swimming across the lake, pushing her young family before her upon that raft. Food is not very plentiful in these parts, and they seem to depend on shellfish and the like, which they get at low tide, for I have often seen them running over the rocks and seaweed.

The Common Weasel (*Mustela vulgaris*) never much exceeds 8 inches. Its colour is duller, its tail flatter, and of the same colour as its body. Both it and the stoat can climb, and both occasionally use mole-runs as a habitat in winter. But though the Weasel will at times attack bigger game, its chief food is field-mice, rats, and moles, so that it is rather the farmer's friend than his enemy. Like the Stoat, it occasionally goes after rabbits. I have met it hunting them in banks in Wales. When either of the species go a-hunting, it is a poor look-out for the rabbit. There is no place of safety for him. If he go home, he will be run to earth. If he take to his legs, the Weasel or Stoat pursues him doggedly like a dachshund. A friend of mine, returning from shooting in Shropshire, told me that a much-besweated rabbit ran across in front of the horse, and as soon as he had passed a weasel came out after him, and retired with reluctance after a free application of the whip. In Victor Hugo's 'Notre Dame' the King of the Gipsies incidentally remarks that the Weasel is called "*adouine*." I do not know if any of my readers can explain the meaning of the term, and pass on to a remark in White's 'Selborne.'

Apart from the recognised species, "there is a little reddish beast not much bigger than a field-mouse, but much longer, which they call a Cane." There seems little doubt that this is merely the female Weasel, which is often considerably smaller than the male, and not another species. This, however, does not seem to be the case with the Assorgue (*Mustela hibernicus*), which, as the name implies, is an inhabitant of Erin. Photographs of it will be found in 'Natural Science' (vol. vi. Plate iv., 1901). Its size is intermediate between that of the Stoat and the Weasel, but while it retains the black tip to its tail of the former, it has much more brown about the belly, and may clearly claim to be a different species.

I have written these few remarks on the Weasel tribe, not in any way as being final, but with a view of provoking others with fuller knowledge to write more. On one point in particular it would be interesting to have evidence, and that is the strange sort of paralysis that comes over a hare when a stoat gets on its track.

The Woodland in March.

By W. Percival Westell, M.B.O.U.

The pleasure of country-life—that is, so far as observing the various changes of the landscape and the close study of the wild life through each period of the year—is considerably enhanced if the observer makes a point of seeing Nature under as many aspects as possible: it is only by rambling religiously throughout the duller months that one can appreciate to the full the advent of spring and then the glow of summer.

The woodland in March—that is, if the weather be at all springlike, such as the morning of which I write — gives evidence on every side of the approach of spring. On the 2nd of March 1902 Dog's Mercury was in flower and the Green Hellebore well above ground and the flower-buds prominent: both these are two of the earliest of the woodland's spring flowers; whilst several days previously the delicate little red tufts on the Nut Hazel—known to the student as the female blossom—were observable. I do not ever remember seeing the male blossom of the Hazel under more delightful conditions than on the aforesaid morning in early March. The catkins, loaded with golden pollen, as seen against the dark and leafless trees and shrubs of the woodland—and more especially where a flood of sunlight caught them—were never more appreciated, and the more so because I had been watching those "lambs' tails" when they were mere little notches, hardly noticeable to the casual observer.

How the balmy spring air seems to have set the birds singing! Skylarks in the fields bordering the woodland in incessant song; Song and Missel Thrushes in strong competition one against the other as to the richness and variety of their sweet cadences; nimble little brown Wrens singing loud and long; Robins in sweeter dulcet notes than ever; Chaffinches tuning their lutes and practising that abruptly finished warble; Hedge-Sparrows uttering their cheery little matin from the topmost twigs of the hazel; Ring-Doves have found their love-songs, and I know of no more rural sound; Great Tits make the woodland ring with their spring notes; a Blackbird or two contribute their mellow vespers; Nuthatches call loudly and Woodpeckers laugh; Tree-Creepers scamper round the tree-trunks more agile than ever; a Sparrow-Hawk pitches on a neighbouring tree-top and casts around as to where shall be laid those blood-daubed eggs; noisy Jays shriek with veritable delight that spring is again near at hand. Proud Pheasants strut by the side of the woodland; Starlings chatter; and noisy Rooks disport themselves on the ploughed lands.

For months past there has not been such commotion and jubilation in the birdland of the woods as on this glorious March morning.

One notices the threefold leaves of the Wood Sorrel and the fast unrolling Honeysuckle; the fresh green of the Elder and the Wild Cherry; the delicate bells of the Snowdrops in the old orchard; the red tints on the twigs and branches; the Hornbeam fast losing its summer tresses, for the new leaves are quickly forming and pushing off the old garb of a bygone season.

Primroses and Cowslips are now showing above ground; the green sheen on the Brambles—an apt illustration of the glories of light and shade—is one of the chief treasures in the woodland just at this season; whilst after a shower of rain or a heavy dew, the dewdrops glisten in the sunbeams like so many gorgeous sparkling gems.

Spring is in the air. Nature lovers know the delight of that first experience of early spring: it cannot be written about, it must be felt to be appreciated.

No summer visitors have reached us at the time of writing, —if we except a female Blackcap which was seen in the district towards the end of February, a truly phenomenal occurrence,—but the likeness of two of the notes of the mimicking Great Tit or Oxeye to those of the Chiff-chaff reminds us that the little herald from the Mediterranean will soon be due, and from now onward the careful student of wild life has one continuous round of unalloyed pleasure before him.

Fossorial Hymenoptera.

By Oswald H. Latter.

Though in some respects inferior in interest to the Social Hymenoptera, the Fossores form a very fascinating section of the most highly gifted order of Insects. Active only during the warmer season of the year, and even then displaying themselves only in bright sunshine, they come to be associated in one's mind with glorious summer days and hours of leisure spent in the open field in watching their various habits and trying to learn something of their ingenuity. A member of this group may be distinguished from the other sting-bearing Hymenoptera without any great difficulty—"hands" and eyes assisted by a fairly good lens being all that is required. From the Bees (Anthophila) they are readily separated by the simple, unbranched, non-plumose hairs, and by the absence of any dilation of the proximal joint of the tarsus of the posterior legs. The former character, however, will not serve to differentiate them from the Wasps and Ants. The true Wasps and their allies (Diploptera) can be at once recognised by their habit of folding their wings, when at rest, longitudinally, so as to diminish their breadth by one-half, and prevent the delicate hinder margin of the wing from overlapping the dorsal surface of the abdomen. This leaves us only requiring a character by which we may discern when we are dealing with an Ant or one of its congeners (Heterogyna), and here we find that the "waist" (petiole) affords a sure guide. In the Fossores the petiole of the abdomen is simple, and, moreover, the species are solitary, while in the Heterogyna the petiole has on its dorsal surface at least one upstanding scale, and the species are social, forming communities, which, as a rule, consist of males, females, and workers.

It is not improbable that a beginner might confuse some of the Augur-bearing (Terebrantia) Hymenoptera, "Ichneumon flies" in common parlance, with Fossores; any of the former may, however, be quickly "spotted" by the double trochanter of the legs, and frequently by the long and curling antennæ.

It is not my intention to give a detailed account of the families and genera included within the limits of the Fossores, but rather to speak of a few species with which I am especially familiar. Of these I shall select one or two from each of the two chief divisions which are structurally distinguishable by the form of the dorsal part of the first thoracic segment (pronotum). In the first division the pronotum is of great extent both dorsally and laterally, and its angles reach back to the tegulæ of the wings: this division includes the Pompilidæ and a few other less conspicuous families. In the second division, known as the Sphegidæ or Sand-Wasps, the pronotum is not so produced, and often is but a narrow collar.

The Pompilidæ are delightful little insects; many of them are brilliantly coloured with red and black markings, and of fair size — about 1 inch long, though most are smaller. They never make flights of any length, but prefer running about in a bustling feverish sort of way, taking short leaps and flights of a few feet at most. Nearly all of them provision their nests, which are mere holes dug in the sand or other light soil, with spiders, and I am strongly inclined to believe that they hunt their prey not only by sight but also by scent, and that this is what they are chiefly engaged in doing as they scurry about upon the surface. A few years ago I devoted many hours during a summer holiday spent on the Norfolk coast to watching the antics of a small black Pompilid (*Pompilus plumbeus*) that abounds on the sand-dunes that for many miles serve as a protecting sea-wall to the Broads district. It was a matter of some difficulty to track any one of the numerous specimens to her burrow, but at length after many futile attempts I was successful, and established myself close to the entry to await developments. The little insect remained but a few seconds within the burrow, and then rushed out in her usual excited fashion and was absent a good while. At last she returned on a brief visit of inspection and sallied forth again; this time I followed, and a couple of yards or so away found her engaged in pulling along a luckless spider whom she had rendered helpless by her paralysing sting. Running backwards and holding the spider in her jaws she made rapid progress (if the word is permissible of retrograde movement!) towards her burrow. Several times, however, did she lay down her burden and pay a hurried visit to the mouth of the burrow; the reason for this behaviour I will mention presently. On one occasion she left the spider on a steeply sloping piece of loose sand, and ere she returned the helpless victim had rolled down several inches. Straight to the spot where she had left it did the Pompilid return, showing a clear and quick memory for locality; and though facial expression of emotion is impossible in a creature possessed of a hard exo-skeleton, yet that insect exhibited every outward manifestation of surprise if not of disappointment. She stopped short on reaching the spot, and for an instant remained motionless as though pondering; then she raised her head, stood high on all six legs, waved her antennæ tentatively in all directions, slowly turned round, and then, like some well-trained hound, made a series of ever widening circular casts round about the spot where her prize had been left, and soon was rewarded by finding her booty, which after a few more stages was safely at the mouth of the burrow. Now the insect went down the burrow and remained out of sight for a few minutes, then hastily reappearing, seized the spider and retreated backwards down the burrow with her victim held firmly in her jaws. I waited nearly half-an-hour for her to come out, but in vain, and was then unfortunately called away; so I marked the spot and got up to go, and in so doing started a miniature sand-slide, which smothered the burrow. With a stiff piece of marram grass I did my clumsy best to reopen the hole and departed. In about an hour I returned and found, to my delight, that my hole had not been accepted, but that the insect had dug her way out by a fresh hole that was now evident close beside my feeble attempt. It was the work of few minutes to dig out the spider whose fate had so interested me: a little careful sifting of the sand soon gave me a nice specimen of the small grey-and-black spider, *Lycosa picta*, with the egg of the Pompilid firmly fastened on to the anterior dorsal surface of the right side of the abdomen. I mention this position because subsequently I dug out scores of Pompilid larders and invariably found this species of spider and no other in the store-house, and *the egg always occupying the above-described position*. Why this position? I can hazard but a suggestion—viz., that in this position it is fairly inaccessible to the legs of the spider, even if it recover from the effects of the sting; but it would be equally safe on the left side, and yet I never found it there. The exclusive presence of *Lycosa picta* was extremely interesting, and furnished me with a most striking case of the value of protective colour resemblance. On these sand-dunes two species of spiders were common above all others —viz., *Lycosa picta*, whose appearance I have described, and which was very conspicuous on the pale yellow, almost white sand; and *Philodromus fallax*, a pale, washed-out looking spider, appearing as though bleached by the sun, and matching the sand with a perfection that is simply marvellous: until the spider moves it is impossible to detect it, and, so far as I observed, it is in no hurry to move, but realises that its strength is to sit still, at any rate in the daytime. Now, notwithstanding the abundance of *Ph. fallax* (which, by the way, is usually regarded as a rare spider), I did not find a single case of this spider having fallen a prey to one Pompilid.

And now let me return for a moment to the great anxiety betrayed by the insect with regard to the front-door of her burrow. The sand is very loose, and when dry is constantly slipping down in petty avalanches, and thus must frequently smother up the hole already made, and then cause very real inconvenience and trouble to this Fossor; hence it is very natural and excusable that she should constantly feel it incumbent upon her to satisfy her mind that no such disaster has befallen her domicile. And here I may mention that I hardly ever saw one of these Pompilids succeed in making a fresh hole for itself by working inwards from the surface: in fact, I believe they are unable to do so unless the surface sand is just moist with dew or light rain, and will hold together instead of falling in as fast as a hole is made. It is a much easier matter to make a burrow by working from within outwards, as my accidentally imprisoned specimen had to do; for then, at any rate, the driest, loosest sand will not be encountered till all the rest of the burrow is complete, and, moreover, the body of the operator helps to keep an open passage-way and to press the sides of the burrow firmly so as to give them more strength. I never saw specimens of *P. plumbeus* out after 5 P.M. in August; they had all retired into their burrows for the night, and from these they usually emerged between 10 and 11 o'clock next morning, before the sun had completely dried the surface sand, and it is well to remember that the larval and pupal stages are passed beneath the surface in the midst of decomposing spiders, and that one of the first acts of the young imago is to dig her way out to the surface from the depths below.

A somewhat curious point about those sun-loving insects is their inability to withstand a comparatively slight rise of temperature. I have seen *P. plumbeus* in full vigour one moment and fall dead the next as it ran on to a patch of very hot sand, so hot that I could only just bear it with my hand. Other insects, too, are similarly affected: at the foot of every little bare patch of sand facing south, or within a point or two of south, were to be seen heaps of dead beetles, flies, and other insects, which I feel convinced had died of heat apoplexy. Indeed I very frequently kill my specimens for collections by placing them in the sun for a few seconds in small glass tubes tightly corked.

On the commons in south-west Surrey occurs another Pompilid, *P. viaticus*, a very handsome black-and-red insect about ¾ inch long. This species provisions its nest with a large brown spider, *Lycosa terricola*, which weighs about four times as much as its persecutor, and is of proportionately greater width. *P. viaticus*, working in firmer soil than *P. plumbeus*, quickly excavates a burrow with her strong jaws and legs, and uses the large coxal joints of the legs as shovels to pass the loosened earth backward, or frequently to drag it out as she herself backs out of the burrow in the course of its formation. I strongly suspect this to be the use of the enlarged coxæ of all the Pompilids, but have only actually observed that it is so in *P. viaticus*. The captured spider is not dragged along over the ground, but is carried along in the heather, and left suspended on a heather twig during the frequent and often prolonged rests. Eventually, of course, it must be carried over the ground; but as the burrows are generally made in small patches of sand, not more than a foot or so in diameter, among the heather, the distance so traversed is never great. I believe the reason of this to be that the ground is generally teeming with ants of various species, who soon would, and often do, make short work of any helpless spider that they may find left about. The burrow is made of such a width as to just admit the fat body of the spider, which fits it like a plug. When all is over the Pompilid most carefully fills in the burrow and smooths down the disturbed soil, and in one case that I observed actually went to the length of gathering dead heather-bells and strewing them in a *negligé* sort of way over the surface, thereby most completely effacing all traces of the deed that had been done.

All Pompilids do not confine their attentions to a single species of spider—it is possible that in other localities the species above mentioned may be found stocking their larders with spiders other than those named here. I have myself found a small Pompilid of another genus, *Salius parvulus*, taking no less than three different species of spiders—viz., *Lycosa terricola, Drassus silvestris,* and *Drassus troglodytes*—all immature, and therefore the identification of the species is perhaps doubtful though kindly given by a high authority: that there were three distinct species is however certain, and these I took from one and the same insect in the course of one morning as she was each time on the point of taking them into her burrow.

Let us pass on to consider some few of the Sphegidæ or Sand-Wasps. In these, too, we find the same habit of storing animal food for the sustenance of the next generation, but there is a greater diversity in *menu*, beetles, caterpillars, aphides, two-winged flies, Hymenoptera, even other Sphegidæ, falling victims in addition to spiders. In colouration also there is a wider range than in the first division, some being black, some black and white, some black and red, and some black and yellow. The burrows, too, are not invariably made in the ground, some species habitually boring in decaying posts, stumps, bramble-stems, &c. My first introduction to members of this division occurred in this way. I had bicycled over to Petersfield with a friend to inspect the parish church, and we were peacefully reclining on a grassy slope in the churchyard when a wasp-like insect carrying something in its jaws came repeatedly and with evident purpose at me. At length it actually settled on my leg, and I perceived that it was carrying a fly: I at once concluded that I was obstructing its burrow with my body, so carefully got up, and having moved aside a short distance, soon had the satisfaction of seeing my insect, which proved to be *Mellinus arvensis*, carry a fly into the burrow over which I had been lying. Numbers of burrows were soon found along the bank, and we blessed the energetic Mellini for the work they were doing in ridding us of the all too pertinacious flies.

The genus *Crabro* is of all the Sphegidæ by far the richest in species—no less than thirty being found in Britain. A Crabro may be easily identified as such by the paucity of "cells" in the anterior wing, there being but one submarginal cell. Only two other genera possess this character —namely, *Oxybelus* and *Entomognathus;* but an Oxybelus possesses a curved spine on the basal part of the dorsal surface of the third thoracic segment, whereas there is no such structure in a Crabro; and while the eyes of an Entomognathus have a covering of fine whitish hairs, those of a Crabro are bald. It is thus a fairly simple matter to recognise any member of this genus. In habits they resemble others of the same family, and may often be found searching along sunlit walls for their prey, and not infrequently imprisoned by the glass of a window-pane. Several species have most remarkable expansions of the tarsal joints of the front pair of legs or of other portions of these appendages. So far as I am aware, the use to which these plate-like structures are put is unknown: it is probable that they are for sexual purposes, inasmuch as they occur only in the males. Similar structures are found in some, but not all, species of leaf-cutting bees, and here, too, they are confined to the males. A very interesting bit of research in bionomics awaits some keen-eyed and patient field naturalist in removing our ignorance on this matter.

Somewhat nearly allied to the Crabros is the genus, Oxybelus, just referred to, of which one species, *O. uniglumis*, is extremely common and equally interesting. The general appearance of the animal might cause it at first sight to be mistaken for a bee of the genus *Epeolus*, both having a black-and-white checked colouring and being not very different in size. Structurally, however, they differ widely not only in the particulars already mentioned earlier in this article, but also in features readily discernible by the unaided eye; of these, perhaps the most noticeable is a pair of remarkable wing-like triangular expansions of the hinder part of the thorax of Oxybelus: these structures stand up obliquely from the dorso-lateral surface, and are most characteristic of members of this genus. As to their uses and functions I can offer no information, nor am I aware of any suggestions on the subject.

Like so many, if not all, of the Fossores, *O. uniglumis* provides a store of animal food for her young, but herself feeds upon a vegetable diet. In June and July I often see them in numbers on the flowers of the yellow Stonecrop (*Sedum acre aureum*), or basking on the warm sand or bare stones near the plants. Often they will dart up in the air and down again to their resting spot, alighting head towards the observer, and their silvery little faces glittering in the sunlight like specks of polished metal. What is the meaning and value of the metallic lustre that is far from uncommon on the faces of Fossores? Is it possible that it is a sexual adornment, or does it help to make them conform somewhat to their surroundings as they bask upon sandy soil with its twinkling grains of quartz, or upon bare stone or rock glittering with flakes of mica or similar crystalline minerals?

The domestic arrangements of the species under notice are like those of its relatives already described. A burrow is dug in the soil, rather firm clayey sand being preferred as far as I have noticed, and into this burrow are carried two-winged flies of many species. In my opinion *O. uniglumis* is one of our chief insect benefactors in annually saving us from plagues of flies. I have seen one individual take no fewer than six flies into her burrow in the course of four minutes and a few seconds, and the burrow when opened contained sixteen flies all paralysed but alive, and only one larva of Oxybelus—it is possible I may have overlooked some, but at any rate a single individual can dig out a burrow in about twenty to thirty minutes, and at the above rate get it amply provisioned in about another twelve minutes—say, roughly, thirty flies accounted for per hour by each individual: give about five working hours per diem, 10 A.M. to 3 P.M., and you have the very respectable total of 150 troublesome and often biting flies put out of the way by each one daily. I have never actually witnessed the capture of a fly by Oxybelus, but have repeatedly seen both captor and captive fall pell-mell to the ground together struggling violently; in a very few seconds the fly is reduced to impotence. I feel convinced that the flies are captured in mid air while on the wing; certainly they are not taken while sitting on the ground, for a few thrusts of the sting of Oxybelus quickly puts a stop to the struggles of the fly, and it is not at all likely that the fly would be carried through the air while still in full vigour and the *coup de grâce* deferred until it had been brought within a foot or so of the burrow, for such is the position in which I have always seen the above take place. This species conveys the flies into the burrow in a way entirely different from that adopted by any other species that I know. Instead of entering the burrow tail first and holding the prey in her jaws, Oxybelus goes in head first and drags the fly along behind her, her sting being used as the means of attaching the burden to her body. The fly is thrown on its back and the sting plunged into the ventral surface of the thorax rather far back (somewhere near where I should judge the centre of gravity of the fly to be situated); the head of the fly is forward. Thus the ventral surface of the fly is close against that of its captor, the head comes under her waist while the abdomen projects behind and brings up the rear of this procession of two. As far as I have been able to see, the Oxybelus makes no use of her legs in steadying her load and keeping it straight, but there are certain strong hairs on the ventral surface of the abdominal segments which, I fancy, prevent the fly from slewing round to right or left. When she has disengaged herself of her spoil the little fly-catcher turns round in her burrow, for she always comes out head first. On gaining the doorway she carefully scratches the soil over the entry before starting on another foray, and this she does invariably even though she returns with a fresh fly in less than a minute, if there be good luck to her hunting. This manœuvre is probably to guard against the intrusion of ants and of inquiline Hymenoptera, who play the cuckoo among insects.

I trust that without going into the minutiæ of structure I have succeeded in giving some idea of the features that serve as the basis of classification of this group of insects, and have conveyed, in suggestion at anyrate, what points may be of generic or specific value. Be this as it may, the chief interest of these animals lies in their domestic economy and the adaptations of structure to individual specific habits; and here, as I have already pointed out, there is room and need for much delightful work on the part of those with seeing eyes.

Scientist *versus* Collector.

By Claude Morley, F.E.S., &c.

There are many extremely philosophical men who hold that the mere compilation of a collection of any branch of Natural History is so much waste of time and animal life; and there are yet more square-figured persons, of the uncreative turn of mind known as practical, who will believe only what they see in Nature, and not that which has given gradual birth through the centuries of geological time to the present state of Nature.

The question has often been heatedly discussed, Which is the more useful of these two classes: that which amasses material, or that which evolves theories therefrom? And, indeed, there is no answer, for both are equally beneficial in different directions: to roam the country, enjoy its beauties, and carry home relics which rise in the form of a monument to happy hours, always reminding one of sunshine, cloud, and field, will be a thing of beauty and a joy for ever to the individual; but to trace the stages of growth of the oak from Silurian Algæ, of Man from Cambrian Protozoa, is to open the eyes of the world to the things an average mind wots not of. Without that unmitigated happiness, an innate love of Nature, there is no collector: and without collectors there could have been no Darwin. Thus we may safely say that the compiler of objects must come first, the deducer of lessons therefrom afterwards; for theories must be founded on facts, and those facts must in the first instance be compiled.

It is a striking feature of Naturalists as a group that so very few are both scientists to startle the world with broad and far-reaching theories—so new as to be at first unbelievable (like the alternating generations of the Gall-flies)—and collectors to actually mingle with the objects *in situ naturæ* and laboriously build up the truths of their economy through long years of patient observation.

There is what one may, I think, call an intermediate group of Naturalists, those who gather in, tabulate, and set forth in serried array the objects and the observations of the collectors, showing what situation each should take in the scale of Nature, and thence passing their heterogeneous masses in natural sequences to the philosopher who could scarcely hope to investigate each for himself. It is to this class that the majority of Field Societies owe their inception: the collector is a solitary individual to whom the beauties of the country are everything, the philosopher is also alone in the erection of thought. On the other hand, the prime duty of systematists and nomenclators is to be perpetually *au fait* with the literature of their period, and hence with those who write it, to mingle with that which is passing in his particular branch of Natural Science, and see that nothing escapes his recording eye. Of recent years a great factor in the institution of Field Societies has been the student of geographical distribution, which in the earlier stages of knowledge could be but partially understood through lack of evidence. Volumes have now been written upon the causes of faunistic local distribution; we know a great deal, not only respecting atmospheric, geological, and chemical conditions governing or influencing a species' range, but also in what directions and to how great an extent each is likely to affect it in its development and habits.

Applying the study of distribution to the entomology of our own islands, it is extremely interesting to note in the first place how comparatively few insects are introduced by artificial means out of the thousands of foreign kinds; this is accounted for, of course, by their isolation by water: a few are imported with foreign timber, a few in grain, others in the ships themselves or in the sailors' clothing, but hardly any except the strongest fliers appear able to cross the waste of waters by means of their own volition. Even now, I believe, it is a vexed question whether the lovely clouded yellow butterfly ever actually breeds with us, and whether the huge convolvulus hawk moth is not almost always with us, though unseen, and their greater or less prevalency due, not to inter-geographical but to local agencies. Secondly, there is the great group of insects which have at some more or less remote period been undoubtedly introduced from lands afar, but are at the present so well established as to have become naturalised: most of these, unlike a beetle called *Lemostenus*, suddenly found to be not uncommon with us so late as last year, which, from its constant occurrence in the vicinity of seaports, I regard as appertaining to this denomination, are by no means desirable acquisitions to our fauna. All or nearly all our noxious kinds upon investigation will be found to have been introduced: the cockroach, though common in London cellars so long ago as 1634,[1] is undoubtedly of Eastern origin. Lastly, there are all those which we are led to believe have bred and evolved exclusively in Britain ever since its severance from continental Europe; and in this respect it is curious to note how closely, in many cases identically, our species have through the length of the ages followed the lines of their trans-marine relatives, and how few forms there are which do not also exist somewhere abroad: thus among our four or five hundred larger moths only five are known to be exclusively British "species."

In their study of distribution the collector and philosopher meet,—the former to search in varying climates and upon distinct formations for species only found under such conditions, the latter to tell him why they should be there alone discovered. In it the nomenclator has no place: his duty it is to differentiate between the forms discovered, to note what are and what are not constant characters in any given group—for points which are invariable in one will sometimes differ widely, not only in another group of species, but even in a single kind. His task is none of the lightest, for he must familiarise himself with all that has been written throughout the world upon whatever group he is studying; he must bring together sufficient material to pronounce positively what are and what are not variable points in the creature's structure, and woe betide him if he should describe as new to science anything already known under some designation which has through ignorance or carelessness escaped his notice. Nevertheless there is great pleasure in noting how marvellously is their structure suited to their needs: edible kinds mimic noxious substances, voracious ones are fleet to capture prey, adipose exoskeletons are protected by shells, the harmless proboscis develops into formidable mandibles, and useless members gradually become obsolete as in the case of deep-sea fishes' eyes and the occipital one which Dr Dendy has recently discovered in the New Zealand Tuatera and lamprey. The collector is the Jack-of-all-trades with an intimate knowledge of none; the systematist *knowing* the life in a tuft of grass marvels at the millions of animalcules which people the world.

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[1] "When the first Asiatic cockroach set foot in Britain, it is impossible to say with certainty, but it was probably not more than about four centuries ago. By the end of the sixteenth century, they had been introduced into the two chief maritime countries of Europe—England and Holland; but we do not get any specific notice of them in zoological literature till near the middle of the seventeenth century, when we read of them as found in flour-mills, wine-cellars, &c., in England. At this early date, it was, of course, only the seaport towns, and principally London, that were frequented by the insect, and it took a long time to spread to inland and country districts—indeed, in all probability, the conquest of England by the cockroach is hardly yet complete."—E. A. Butler, 'Our Household Insects,' p. 117.

Rutland Birds: Are they increasing or decreasing?

By Reginald Haines, M.A., M.B.O.U.

Only when the complete set of Victorian County Histories has come out shall we be able to form a map of the fauna of England, and perhaps take a census of all our wild animals and birds. In the meanwhile it will be instructive to sum up such results as it has been possible to obtain in the case of one county at least, albeit a very Zoar among counties.

Rutland is very much the smallest of the English counties proper. Its natural features present nothing striking, nor do they show any great diversity. Out of nearly 98,000 acres, which represent its area, not 100 are waste or heath land, and not 200 are water. There are no fenny districts, and no really large sheets of water. There are scarcely 4000 acres of woodland, and even the hedgerow trees have been much thinned of late years. Thirteen or fourteen thousand acres are under grass, 20,000 under cereals, and 8000 under roots and leguminous crops. Characteristic of the district are stretches of open undulating country with small villages scattered at considerable distances from one another. The rivers and streams are small, and apparently diminishing in volume.

All this being so, it is not surprising to find that the total number of species of birds found in Rutland is not large. Less than 200 have been recorded in all. Some of these rest upon but a single observation, and can only be regarded as the merest stragglers. Such are the Eagle Owl (1879) and Bonaparte's Gull (1900), if the instances recorded are admitted as authentic, and the Bee-Eater, which bird seems actually to have nested in Rutland (see Lord Lilford's 'Birds of Northamptonshire').

But the real bird population of Rutland consists of

1. *Residents* that remain all the year and nest in regular course. These number fifty-eight, if the Heron be included, which nests close to the county boundaries.
2. *Migratory Summer birds* that
   - (*a*) nest regularly. These are thirty-one in number, if the Wood-Wren be included;
   - (*b*) nest occasionally. These are the Quail, the Teal, the Pied Flycatcher, the Snipe, the Water-rail, and the Redshank, the last a bird which has only just added itself to our nesting species.
3. *Migratory visitors on passage*, such as the Ring-Ouzel, Osprey, and Sandpiper; and the *Winter visitors*. These together amount to about thirty.

The total comes out at about 125, of which less than 100 breed in the county.

Many interesting species that used to nest in Rutland have long ceased to do so, such as the Kite, the Buzzard, and the Raven. Less than a hundred years ago all these used to be quite common, the Kite more especially so, but none of the three has been known to breed since 1840. There are still at least three Kite's eggs in existence, which were taken in this district. It would be no very difficult matter, with the co-operation of the farmers and landowners, to reinstate the Kite in its ancient haunts. The county is overrun with rats, moles, and mice, which would afford them plenty of food. Such a beautiful and majestic bird would add much to the charm of the landscape. Another most interesting species has become extinct as a nesting species in the last forty years, and that is the Norfolk or Thick-kneed Plover. Ryhall Heath, its last habitat, has proved no longer fitted to its requirements.

The Peregrine and Merlin still appear regularly as winter visitors, and the Sparrow-Hawk and Kestrel hold their own fairly well in spite of the efforts of gamekeepers to exterminate them. The White Owl is common, but the Wood Owl is scarcely holding its own, partly owing to the iniquitous poletrap, which works great havoc in this species. To the late Lord Lilford we owe the acclimatisation of the Little Owl (*Athene noctua*), which is now found as a breeding species all over the county. It is a most engaging little bird, and extremely useful to the farmer, but one that stinks in the nostrils of the gamekeeper. As it is not so nocturnal as its congeners, it suffers more from their persecution. Lord Lilford, besides introducing this species, urged the introduction of the continental Stork, a bird which adds so much to the interest of many foreign cities.

The only other successful acclimatisation of species has been in the case of game-birds. The French Partridge, introduced about 1850 by Sir Gilbert Heathcote into this country, has thriven so well, that on some estates its nest and eggs are purposely destroyed. Though not really such a fine game-bird as our own Partridge, it serves the sportsman better when driven. By some it is supposed to quarrel with the indigenous breed and drive it out, but this is very doubtful. It runs a better chance of survival in the contest for life, because in this fox-ridden county it has learnt to build in safer places than the English breed, making its nest sometimes even above the ground, in haystacks and byres. An attempt to introduce the "Virginian Colin" failed. Our severe winters are too cold for them.

But the ordinary Quail deserves more attention than it has received. In common with the rest of England, Rutland has to lament the increasing scarcity, if not the approaching extinction, of this very esculent and altogether admirable bird. Opinions differ as to the causes of the diminution in the numbers of the Quail that come to our shores. This may partially be accounted for by the new methods of cultivation now in use, that render the countryside less suited to their habits; but the main reason, no doubt, is the hideous slaughter of this species, while on migration, in Italy and elsewhere. Where 150,000 used to be taken at Capri in Italy, only 60,000 are now obtained. Can we be surprised that but a few stragglers escape to our shores? However, it is still met with here and there in Rutland every year, most probably breeding in suitable places. The last record of a nest was in 1897. At least one has been shot this year, in this case at Ridlington. Experiments carried on in America point to the possibility of breeding Quails that would remain with us all the year round. This would be well worth doing if it were possible.

A bird we would gladly entice back in greater numbers to the Welland Valley is the Wild Goose. There was a time when boys had to be hired to "shoo" off the Wild Geese from the Gretton meadows, where their appetite and excrement did much mischief. Now it is a rare event for a "gaggle" of any of the Wild Geese—the Bean, the Pink-footed, or the White-fronted—to settle in the meadows. Those that fall to the gunner are mostly Canadian or Egyptian geese from some ornamental water. The various Ducks are, if anything, commoner, the ordinary Wild Duck breeding in numbers, and the Teal occasionally. But the records of rare Ducks come almost entirely from the ponds at Burley and Exton. Snipe are still quite common, and the full Snipe not uncommonly breeds with us.

Among the smaller birds the Wheatear, though still a breeding species, has certainly decreased in numbers, as it has elsewhere, and the Stonechat is far more uncommon than it used to be. The Nuthatch, a handsome and interesting bird, though plentiful in certain localities of the county, is entirely absent in others, and does not seem to spread at all.

Four species which could ill be spared, but which want very careful protection, are the Hobby, which nests regularly; the Pied Flycatcher, which certainly occurs; the

Wood-Wren, which is only found round Exton; and the Woodlark. The last-named, considered by some, among them the late Lord Lilford, as the queen of our songsters, is extremely rare and local. There seems to be nothing to account for its scarcity, which is to be deplored but cannot be remedied. It does not seem to undergo any particular persecution, nor is its nest, though one of the very earliest in the year, particularly liable to destruction.

Against the above cases of stationary or decreasing species can be set many that have certainly become far more numerous of late years.

The Turtle-Dove, for instance, has much extended its range. It scarcely appeared in this part of England till the middle of last century, and the first nest on record was not found till 1859.

The Missel-Thrush a hundred years ago was comparatively rare in this as in many parts of England. T. Barker, Esq., of Lyndon, in his phenological observations from 1735 to 1800 does not mention it at all.

The most recent addition to our migratory breeding birds has been the Redshank, which has lately selected a nesting site in the county.

A very handsome species that has quite lately become a common nesting species in this as in other parts of England is the Great Crested Grebe. It has no doubt taken advantage of the protection afforded it by the owners of the larger pieces of water. Most landowners seem ready enough to extend their ægis over any bird that is not credited with designs on their precious partridges and pheasants. But I believe one of the causes of the increase of the Great Crested Grebe, as of the Ducks, to be the multiplication of large reservoirs. These also attract such birds as the Greenshank, the Dunlin, the Sanderling, and others, which we may expect to see somewhat oftener now than heretofore.

Another bird that has increased very considerably is the Hawfinch. Before 1850 it was very rare, and a nest was not found till after 1860. Now a nest may be looked for in any orchard in the county. It is not, however, a very desirable acquisition, as it is destructive in orchards and gardens, and, moreover, is very wary and skulking in its habits, so much so that in twelve years' observation I have never yet seen one in a wild state in the neighbourhood of Uppingham.

The Great Tit, the Blue Tit, and some of the Warblers have more than held their own, in consequence, no doubt, of the vigorous destruction of the birds of prey. The same cause has probably contributed to the increase of three very attractive birds—the Redpoll, the Bullfinch, and the Goldfinch. The first of these is not only a winter visitant, but it also breeds regularly though not in any great numbers. The Bullfinch is one of our common birds, and is especially conspicuous in winter. That universal favourite, the Goldfinch, has undoubtedly profited by the Bird Protection Acts. It has, however, always been commoner than generally supposed, though it escaped notice owing to its habit of frequenting the tops of trees. It is so common now that it is no unusual thing for one small orchard of an acre or less to have 100 young birds reared in it. The Tree-Sparrow, an uninteresting species, has always been common in Rutland.

The Moorhen has thriven exceedingly in the last fifty years, and probably there is a nest for every hundred yards on the Rutland streams and dykes, and this in spite of the inordinate increase of that odious pest, the common rat.

Perhaps the most striking example of the survival of the fittest, that is of the most assertive, is afforded by the Starling. Before 1850 it was by no means abundant, now it is no unusual thing to see it in flocks of 1000 at a time. Though a most useful bird to the farmer, it has a bad habit of dispossessing other more desirable birds of their nesting-holes, and we can have too much even of so good a thing as the starling. Another bird which has multiplied as much, and has none of the good points of the Starling, is the House-Sparrow. The Avian Rat, as it has been called, requires to be kept vigorously down, and county councils would do well to offer rewards for sparrow-heads at so much a hundred. The thinning of the birds of prey has no doubt aided the Sparrow enormously.

It is a moot-point whether the Lark and the Swallow and the Peewit are as numerous as they used to be. The Swallow tribe seem to be less common than they were, but they certainly vary a good deal in different seasons, and the range of the Sand-martin especially is restricted by the destruction of its nesting-sites. The Peewit suffers from the traffic in its eggs, and also from the egg-eating propensities of the Carrion Crow, the Jackdaw, the Rook, the Magpie, and the Jay. All these birds are very numerous, and increasing rather than diminishing. In a radius of four miles round Uppingham the population of Carrion Crows at the end of the breeding-season must be at least 400, and probably many more. No one can take a walk round the neighbourhood of Uppingham without seeing a pair of magpies, and their numbers must be at least half that of the Crows. Every coppice or spinney has its pair of Jays and every wood its colony of them. The Rooks must number four times as many as the Crows, and the Jackdaws probably nearly twice as many. We would not wish to see the Magpie and Jay exterminated—far from it,—but the whole tribe of Corvidæ should be sternly thinned down. We could do well with a fifth of their present numbers. At least one out of every three nests of Blackbirds, Thrushes, &c., is destroyed by one or other of the Corvidæ, as I believe, though the damage is by some laid at the door of the Weasels and Squirrels.

The Lark undergoes terrible havoc at the hand of bird-catchers. Hundreds of thousands have been taken on the Sussex downs. In the Rutland district they are still common, though not too much so.

It remains to mention the Kingfisher and the Green Woodpecker, two of our loveliest species. No one who has seen the wave of glorious green and gold made by the latter as it undulates through the air, when startled from its feast on an appetising anthill, will readily forget it, or its strange yaffle or laugh. Fortunately Rutland seems to suit it, and it has become very common. The Kingfisher, our only other bird of tropical plumage, generally seen as a flash of most beautiful azure and the richest brown, has profited by the Bird Protection Acts, and also by a series of mild winters. To show how numerous it really is, and how terribly it suffered from the predatory gunner, it will be sufficient to say that in a hotel adjoining the Leicestershire cricket-ground there was to be seen in May 1899 a case of seventy-five Kingfishers, all shot during the preceding six months, their proprietor boasting of them as a fine winter's bag.

We can now sum up the results of the facts mentioned. About six species resident in comparatively recent times have disappeared, and half a dozen others have become considerably scarcer. Among these dozen or so species are naturally the more interesting and striking forms. Such a result is inevitable from the march of humanity, armed with weapons of precision. Even the advancement of knowledge is used as a pretext for the destruction of rare birds, and the ineradicable *amor habendi* causes many a priceless nest to be rifled.

Nearly a score of species have, on the other hand, become commoner, some strikingly so. Some of the Gulls, for instance, are increasing their range and follow the floods in the Welland Valley in large numbers. The success which has attended the introduction of two or three species encourages further experiments in the same direction.

The causes of the decrease of species, where they have decreased, may be traced to (1) drainage, high farming, and the cultivation of waste lands; (2) the destruction of birds supposed to be prejudicial to game; (3) the sportsman and the lout with a gun, who both say, "What a divine day! let us go and shoot something"; (4) the ornithologist, who wants skins and specimens, and to the egg-collector, who wants British-taken eggs; (5) the destruction of migratory species by our own bird-catchers at Brighton, Beachy Head, and elsewhere, and more especially by foreign bird exterminators at Heligoland, in Italy, Sicily, and France.

It must be remembered that what is detrimental to some species of birds is beneficial to others. For instance, game-preserving kills off our finer and more conspicuous birds, but it conserves and shelters our Warblers in two ways—by giving them quiet precincts, where trespassers are forbidden to enter, for their nesting operations, and by destroying their ruthless feathered enemies. Consequently Chaffinches, Linnets, Yellow-Hammers, Whitethroats, Willow-Wrens, and the Warblers generally abound in every covert. It would be interesting to estimate their numbers, but it is impossible. For instance, in respect to the Linnets alone, every patch of gorse may be expected to have a nest to every three bushes, and each nest has five eggs. There may be thirty patches of gorse in a radius of four miles, with (say) 150 nests in these and 500 young that come to maturity. It is easier to make a guess at the numbers of another more important bird, the Nightingale. Three or four pairs build yearly in the town of Uppingham itself, and there will probably be 100 pairs in the immediate neighbourhood.

Among the causes of increase in our birds, besides the causes already mentioned, such as the shelter afforded by game-preserves, and the Bird Protection Acts, and the actual introduction of new species, there is undoubtedly the spread of a general knowledge of birds and a greater interest in them. More people know a hawk from a hernshaw than used to.

A few words, in conclusion, about the Birds Protection Acts. These have been drawn up and enforced on radically wrong principles. They are at present most confused and confusing. There is one schedule for birds protected, another for eggs. Then each county has a different set of both. In these lists birds appear which are never seen in that particular county, sometimes that are never seen in England. The same birds also appear under different names in the same list. Again, the penalty, when it is enforced (which is seldom), is ludicrously inadequate, and the offender is allowed to keep the bird. Say he shoots an osprey. He is fined 5s. and sells the bird for £2. The only satisfactory plan would be to ask the ornithological authorities to draw up a list of birds that do *not* require protection, such as the Sparrow, Sparrow-Hawk, Carrion Crow, Rook, Jackdaw, Magpie, and Jay. Forbid every other bird to be shot or molested in breeding-time, with a possible exception in the case of Plover's eggs, which might be taken up to a certain date. Birds like Larks should not be killed at any time. But in order to make this protection effective the liberty of the landowners on their own estates would have to be curtailed—there's the rub! It is useless to forbid the ordinary citizen, who generally has no gun or any murderous proclivities, to shoot specified birds or rob their nests, when an owner can destroy any bird on his own land. Special legislation should be made against ornithologists, egg-collectors, and such persons as under the cover of science do an infinity of harm to our birds. A country-side, however lovely, would be, without birds, but a lifeless and a mournful paradise.

The Study of Microfungi.

By Dr C. THEODORE GREEN, F.L.S.

IT is not unnatural for a medical man to be attracted by a pathological aspect of botany such as the study of microfungi affords.

The purpose of this article is to show how fascinating is the study of these small bodies with the aid of the microscope—an instrument which every field naturalist should possess.

All of the species now dealt with are parasitic in the tissues of living plants, inducing in them well-known diseases of cereal and other crops, the vast economic importance of which is appreciated by every student of agriculture and horticulture, and which also infect a large number of our wild plants. Many other families of microfungi are saprophytic—*i.e.*, they infest dead or decaying vegetable matter.

One point in favour of this particular study is the small space taken up by collections. Another advantage is that the study of microfungi is well adapted for ladies, as the processes involved are cleanly and require delicacy of manipulation. The services which the late Miss Ormerod rendered to agriculture in this connection were very great, and afford a brilliant example of what a woman can do and has done in this branch of research.

At this time I am dealing with the families of the USTILAGINEÆ and the UREDINEÆ, all of which are parasitic and not saprophytic at all.

First find your microfungus; and allow me to say that these small plants need patient and careful search among the fields and waysides. They rarely obtrude themselves upon one's notice like a flower, but hide away among tangled vegetation, for the most part on the under-surfaces of leaves, and on those nearer the ground rather than those more recently unfolded.

A word of caution may be given here not to mistake for a fungus every discoloured spot or streak that one finds upon leaves. Insects are responsible for many of these spots—(1) by causing minute galls or pseudo-galls, (2) by puncturing the leaves, thus producing a change of colour, (3) or else a collection of hair-like irritation-cells, the real nature of which is only apparent under the microscope.

Having found a plant affected with a fungus, pick two leaves to dry and one to examine fresh and from which to make sections. A discarded directory will do to dry the leaves in; then fasten them on cards, some 4 by 5 inches, so as to exhibit each side of a leaf. It is well to fasten a piece of tissue-paper over the top of the card so as to protect the spores from being rubbed off. The back of the card should bear the name of the fungus and its stage of growth, and that of the host-plant upon which it grew: also insert the place where it was found, and the date.

Only a very small piece of leaf is needed to cut a section from, through one or more of the spots or sori of the fungus. To do this, peel a young shoot of elder of all the bark, and then split a 3- or 4-inch piece of this down the middle, then place the piece of leaf between the halves of pith, and shave off pith and all as thinly as possible with a sharp razor. It is necessary to sharpen the razor frequently, as sections cannot be made thinly enough unless the edge be keen. Now remove the pieces of pith with a needle mounted in a wooden handle, and transfer the section to a glass slide with a wet camel's-hair brush, and mount in Farrant's solution or in glycerine-and-water; and lastly, seal the cover-glass with any of the ordinary cements.

A common, if not the regular, way of preserving the leaves is to fold them loosely in scraps of paper, so that they can be readily removed for examination; but I think this a troublesome and untidy method, and unnecessary when we have a micro-section to examine corresponding to the dried leaf on the card.

The cards can be arranged in families and kept in envelopes with the name of the genus or species written outside.

The Spores.—" By their fruits ye shall know them " is an ancient dictum that applies with especial force to the groups of plants under consideration. In higher groups of plants, such as *Carex*, we know that it is often impossible to determine a species unless we have the mature seeds to examine. But, happily for the student of the Sedges, each species has but one kind of seed. In the *Uredineæ*, however, species have one, two, or three kinds of seeds or spores produced in regular sequence from the same mycelium in an alternation of generations. To this remarkable state of things Dr M. C. Cooke has given the rather awkward name of *dichocarpism.*

The *mycelium* of a fungus is its vegetative system, and corresponds partly to the roots of higher forms of plant life.

Dr C. B. Plowright thus tabulates the spore-relations :—

PROMYCELIAL SPORE.

Teleutospore.	Uredospore.	Spermogonium.	Spermogonium.
	Teleutospore.	Uredospore.	Æcidiospore.
		Teleutospore.	Uredospore.
			Teleutospore.

Not only are there these several phases of existence that make up the life-history of a species, but many of them are heterœcious in addition—*i.e.*, part of their life is spent on one host-plant and the other part is completed upon a host-plant of quite another order ; ex. gr., *Puccinia caricis* in April produces spermogonia upon the Nettle, *Urtica dioica.* These spermogonia are minute papules formed upon the veins of a leaf or upon the stem. When mature they rupture at the apex and disclose fine threads surmounted by spore-like *spermatia* embedded in a glutinous material that swells with moisture. Shortly afterwards are formed the well-known Cluster-cups or *Æcidia.* Under a simple lens these are seen to be a multitude of beautiful little yellow cups with torn edges, looking like the petals of a flower, and they contain the yellow spores. After these have dispersed there is nothing more to be seen upon the Nettle.

We now have to look for certain species of *Carex*, as *hirta*, *riparia*, *pseudo-cyperus*, &c. Upon the leaves of these Sedges appear brown spots which contain the uredo-spores covered over by a pseudo-peridium, which is merely the altered epidermis of the leaf. Presently this ruptures, setting free the spores, which are globose and finely echinulate or spiny. When these have dispersed, other sori form on the now withering leaves, which contain the double-celled teleutospores. These last are so called because they form the last phase of the cycle of generations. When the teleutospores germinate after resting through the winter, they give rise to promycelial spores, which in their turn give rise to spermogonia upon the Nettle again. During the past three years I was unable to find the Cluster-cups on the Nettle, but during this last year it was common enough.

It is upon the structure of the teleutospore that the generic classification is based. In *Uromyces* it consists of a single cell supported upon a pedicel or delicate stalk which connects it with the mycelium in the tissues of the host-plant. In *Puccinia* there are two cells placed one above the other. In *Triphragmium* there are three cells, two placed laterally and one beneath, to which is attached the pedicel. In *Phragmidium* there are from three to five cells placed in a chain. They fall away from each other as they become mature, and each is capable of germinating. In *Xenodochus* there are many cells in a row. I have counted as many as twenty-one cells on one pedicel. In *Melampsora* the teleutospores are cylindrical, with polygonal sides from mutual pressure. In *Coleosporium* they are cylindrical or clavate, and consist of three or four superimposed cells, the divisions of which are not always easy to see.

Not many years ago each of these spore-forms was thought to indicate a distinct species, and they were then termed—*Æcidium*, for the Cluster-cups; *Trichobasis*, for the single-celled uredospore; *Uredo*, for the single-celled teleutospore with a pedicel, now termed Uromyces; and *Puccinia*, for the two-celled teleutospore.

Biological research, in the way of carefully conducted experiments in the artificial germination of spores and the placing of these upon suitable host-plants, has shown that these various spore-forms belong to the same species. Some species, however, omit one or more of these spore-forms, examples of which will be given later on.

Formerly *Æcidium* comprised a large genus; now it is a small one, only a few species remaining that have not been found to be connected with other spore-forms, and even these may yet be found to belong to already known species.

On the Claims of the Green-backed Gallinule (*Porphyrio smaragdonotus*) to inclusion in the List of British Birds.

By Rev. M. C. H. Bird, M.A., M.B.O.U.

Now that some three dozen examples of the genus Porphyrio (*P. cæruleus* and *P. smaragdonotus*) have occurred in the British Isles since 1845, it seems that these lovely birds have sufficiently shown their appreciation of our hospitable (?) shores to be included in the list of rare and occasional migrants, and to have the brackets and stars removed from their names in our next ornithological census. As to the season of their occurrences, January has afforded one example, June two, July five, August ten, September five, October seven, November one, and December three; of two the month of capture is not recorded. August, therefore, may be taken as their great month, and 1897 the year of their greatest abundance. As to their distribution, three have occurred in Ireland (Kerry); three in Scotland (Perth, Inverness, and Argyllshire); one in each of the English counties of Essex, Surrey, and Devonshire (caught off the coast); two in York, Somerset, Northampton, Northumberland, and Hampshire; and sixteen in Norfolk: all, it will be noticed, maritime counties with the exception of Northamptonshire. One of the two which I have mentioned from this county may probably have escaped

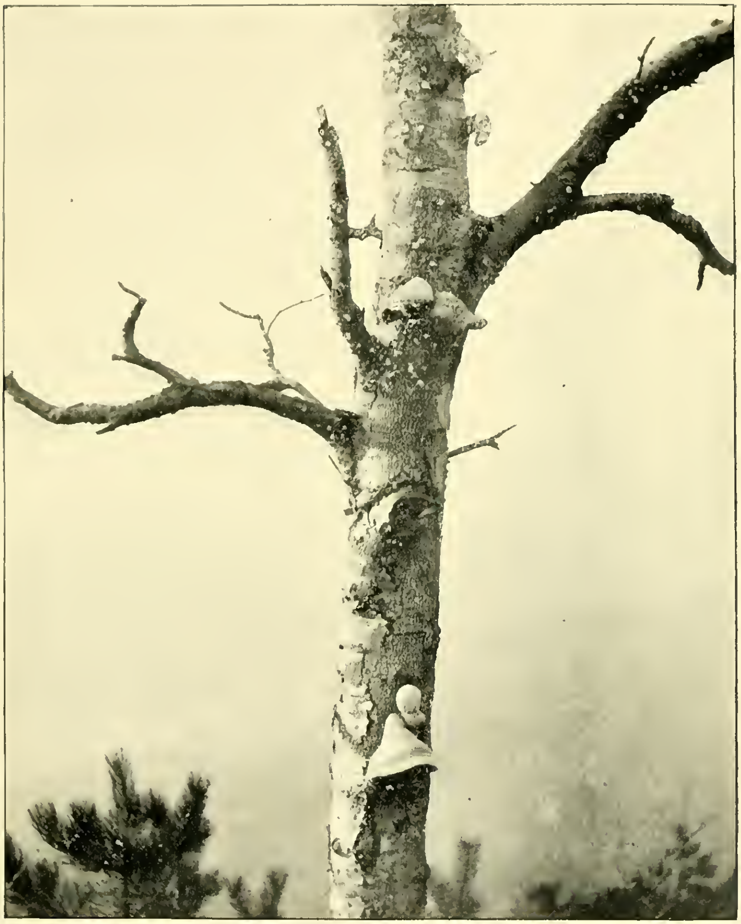

Photo by A. E. Johnson.

POLYPORUS BETULINUS ON BIRCH TREE.

from the Lilford aviaries, but the other (a *cæruleus*) Lord Lilford handled and looked upon as a genuine migrant (*vide* his 'Birds of Northamptonshire'). If we consider that this may have been the case with the remaining thirty-five, it is not strange that they should all have occurred near the coast; but it would have been suspicious if such large and conspicuous birds had been first seen far inland, whereas if they had escaped from confinement, the same argument applies as to the probability of their having been seen ere they approached so near to the sea.

Of the above-mentioned thirty-six specimens, twenty-four were identified as belonging to the green-backed race and six to the purple form, whilst six are recorded without any specific qualification. It is to the first-named species that the following notes chiefly refer, not only because their occurrences, though least expected, have been the most numerous, but because all sixteen which have been seen or shot in this county (Norfolk) have been representatives of it; and all but one of them have appeared in the Broad district, and that within a radius of less than ten miles. The comparatively heavy bag from this neighbourhood may partly be accounted for, in addition to the naturally attractive features of the locality, from the fact that probably no other portion of the United Kingdom is so thoroughly and persistently searched by gunners, in season and out of season, on Sundays as well as week-days, throughout the year. Some small and rare warblers may, and probably do, escape detection, but certainly few larger rare birds rest here for more than the hours of darkness without discovery and subsequent pursuit. The record Porphyrio year with us was 1897, and although, of course, the five specimens that were then secured around our Broads, together with the one recorded from Yorkshire ('*Zool.*,' 1898, p. 113), may have escaped from Woburn Park, where a large number of these birds were then in a state of semi-captivity, yet the atmospheric conditions prevailing about the time of the first victim then being secured were almost identically the same as those surrounding the advent of the last locally killed specimen, as ably pointed out by Mr J. H. Gurney in the 'Field' for January 10, ult. June (1-10) 1897 was exceptionally cold, E.N.E. winds prevailing, with very little sunshine; the early part of the month was very winterly on the Continent, and on June 18 we had a heavy W.S.W. gale, with subsequent S. and W. winds. On June 23 a Porphyrio was killed at Somerton, and another seen at the same time was subsequently secured near by on July 3; one at Barton on July 21, and others at the same place on August 3 and September 11. Meanwhile from July (10-19) we had had another spell of E.N.E. winds, shifting on 20th to the W. A Lesser Grey Shrike had previously been killed in Kent on May 15, a Squacco Heron in Orkney at the end of June, and a Tawny Pipit at Yarmouth early in October. The appearance of other similar forms of Southern bird-life may be found to synchronise with most of the recorded instances of the occurrence of *P. smaragdonotus* in the British Isles within recent years.

Likewise in 1898 from July 4 to 13 we had a spell of N.W. and N.E. winds, changing on the 14th to W.S.W., when a Porphyrio was seen at Potter Heigham, and one was shot at Barton a few days afterwards.

In 1885 one was killed at Horning on October 16, and a Desert Wheatear at Holderness (Yorkshire) on October 17. From 5th to 13th the weather was very stormy, with N. and N.W. wind on the last three days, veering to W. on the 14th. Of only one out of our thirteen county-killed specimens can it be said that any signs of possible previous confinement were noticed, the one shot at Barton on August 3, 1897, having a few feathers abraded; but this, of course, may have been due to other causes, such as age, natural contact with vegetation, or unnatural contact with shot! Mr Gurney stated that the example killed at Hickling on September 7 might have escaped from Northrepps, near Cromer; but another bird of the same species was killed at Stalham on November 1 of the same year, which could not thus be accounted for—although it has been suggested that another Barton bird of August 23, 1879, might have escaped from Mr Meade Waldo's place in Kent.

One poorly developed Allen's Porphyrio is picked up in a helpless condition on our shore, and because of the range of its species approximating more nearly to our latitude it is less hesitatingly admitted into the immigrant catalogue, whereas sixteen far more powerful birds are branded as mere escapes. It reminds me of the pennies found in our old tan-covered school gymnasium floor, which never failed to find claimants because so many boys once had one in their custody! for more valuable and more rarely found coins there were fewer claimants, because such things were less frequently imported to the playground, though coming from the same original mint. Against the probability of the Green-backed Gallinule or Porphyrio having strayed to Great Britain as a voluntary occasional migrant the following objections have been brought forward:—

1. It is of small range in its natural habitat—less widely distributed even than *P. cæruleus*.

2. It is a bird of no sustained flight, and most reluctant to take wing.

3. Intervening countries do not acknowledge or obtain it, nor has it been observed at lighthouses or migrational observation stations.

4. Many of these birds are annually imported, and this of all birds is, on account of its climbing powers and deceptive bulk, most difficult to "stow" or confine. One at least has been claimed as an escape.

Let us digest these objections in order.

In the first place, there is no inherent impossibility in any bird that can fly for its occurrence in Britain, however circumscribed its natural geographical area may be. From unknown causes birds sometimes, at first suddenly and then regularly, extend their range both for purposes of breeding and autumn migration. On a small scale such an extension has taken place in our own islands within recent years amongst Nightingales in spring and Green Woodpeckers in autumn. The 1888 visitation of Pallas's Sand-Grouse was a similar movement upon a far larger scale. Moreover, those birds which have the most extensive breeding-range do not necessarily wander at regular intervals to countries or districts distant from their accustomed latitude or longitude, as witness the excitement caused amongst ornithologists by the sudden and unexpected occurrence of numbers of Ruddy Sheldrakes in this country in 1892.

Secondly, as to the Porphyrios being incapable of sustained flight and most reluctant to take wing, the same remarks might be made concerning the Coot, Moorhen, Land-, Water-, and Spotted-Rails. The three latter, however, although so apparently crepuscular and difficult to flush, are nevertheless regular migrants, and perform almost exactly the same journey that the Porphyrios are said to be incapable of. Both Moorhens and Coots have been obtained at lightships and migration observation stations, and those who listen to the night sounds of nature know well enough how far and how frequently "Moorcocks," which "shun the day," stray from the vicinity of water at dark; whilst anybody who has witnessed the Hickling coot-shoots are well aware of the power of these spluttering and ungainly-looking fowl when they are once well up in the air.

As to the third objection, that *Porphyrio smaragdonotus* is not acknowledged or obtained on the Continent, between Great Britain and Africa, the latter part of this argument seems to imply that no "escapes" even are allowed to occur from the importations that arrive at Paris and Antwerp, for example, as well as London and Liverpool. As to the former statement, Mr J. H. Gurney (to whom I am much indebted for assistance in compiling these notes) states in 'Zool.,' 1886, p. 72: "*P. smaragdonotus* has occurred on different occasions in Italy, and in the south of France, as might have been expected: they may have escaped, but we can look with less suspicion on our British ones from the fact of their having occurred also in the intervening countries." He also writes in the same place: "They" (i.e., *P. smaragdonotus* and *cæruleus*) "are just as capable of migrating as a Moorhen; moreover, they are migrants in Egypt, and the Purple Gallinule (*cæruleus*) is a known migrant in Spain. I believe I am correct in saying that neither of these species has been as often brought alive to this country as their black-backed ally from Australia (*P. melanotus*), which has never been killed at large." This was true, as far as was known, in 1886; but on p. 427 of 'Zool.' for 1894 he corrects himself, having meanwhile examined the Porphyrio taken at Redbridge, near Southampton, in 1864, and found it to be not *cæruleus* but *melanotus*. As to no representatives of either form of Purple Pallinules having been seen at lightships or other migrational observation stations, this no more militates against their occasionally visiting our shores spontaneously than the failure of other rare migrants to put in an appearance at such places invalidates their claim to be included in our list of occasional visitors. Mr J. H. Gurney also writes me: "As long ago as 1869 I saw four *P. cæruleus* at Boulogne Museum, said to have been killed in the Pas de Calais, and at that time they were seldom kept in confinement."

We now come to the fourth objection, that "many of these birds are annually imported to our shores, and that probably, therefore, all that have been seen or killed here have merely been "escapes"—Porphyrios being, on account of their climbing powers, most difficult birds to confine, and their deceptively bulky appearance, in spite of their rail-like compressed sternum and ribs (the probable derivation of our simile "as thin as a rail"), which is a natural provision for, or an evolved consequence of, their life amidst dense and rank vegetation, which structural modification may delude their owners into attempting to enclose them with prison bars too wide apart, or wire mesh too large.

In the first place, how is it to be accounted for, if they were escapes, that so few were claimed although so widely advertised as "found" in the various Natural History periodicals? Those persons who attempt such acclimatisation would be the very people to read these journals, or at least to be in touch with those who do. Again, if escapes, how is it that only one out of the thirty-six examples has shown the slightest sign of previous possible captivity? It is easy to say that those who keep such birds allow them so much range and liberty that no trace of confinement in condition, feather, beak, or feet is likely to occur, and that such abrasions, if brought about, would rapidly disappear upon their gaining liberty. Damage to the soft or bare parts of the body might disappear, but worn or broken feathers would not "grow up" until the whole of the injured item of plumage had been moulted. Further, if escapes, it is, to say the very least, highly remarkable that such large and conspicuous birds should gain access to spots so congenial to their natural habits without being noticed *en route*.

It is also noteworthy that in Ireland, as well as in England and Scotland, the majority of specimens have occurred in places so near together. Ussher, in 'The Birds of Ireland,' says of the green-backed species (after admitting the possibility of the escape theory): "It is interesting to note that the only two instances of its capture in Ireland should have occurred in the extreme south-west, where many other rare birds have wandered. The district is at a great distance from places where foreign birds are likely to be kept. It is also worthy of remark that both the above birds occurred in autumn, when the migratory instinct in the Rails must be strongest, as the reports of their occurrences at lighthouses show." What Mr Ussher says of the Irish visitants applies to all three recorded from Scotland, and to the great majority of the English examples. If escapes, they must have escaped either from purveyors or purchasers. All the former are publicly known, and their chief clients also, although the latter only would probably care to claim or proclaim their losses; thus the suggested "where from" of the Norfolk Porphyrios is either London or Liverpool dockyards or the menageries adjacent thereto, or the aviaries at Lord Lilford's (Northants), Mr Meade Waldo's (Kent), or the Duke of Bedford's (Woburn). In either case, it is strange that a supposed escape should have flown N.N.E. or E.N.E. when its natural habitat was due S. or S.S.W.

Referring to the 1897 examples only, my opinion is that they all came to us from the coast, for the following reasons: The first bird secured was killed at Somerton, the nearest to the sea of all the Norfolk-obtained specimens, and another was seen at or about the same time and place. The second bird that year met its death (about a mile farther inland) on the Catfield side of Hickling Broad, July 3, only ten days later: it was seen to approach the Broad the evening previously, in exactly the same fly-line as immigrant Bitterns have for generations been observed to use. Its gizzard contained some young reed-tops, broken-up fragments of coleopterous elytra, some seeds (which failed to vegetate under pot culture), and nearly half a thimbleful of clean even-sized grit, which, in the independent opinion of two witnesses, was supposed to be sea-sand. Hickling Broad has no sandy margins, and this sand might easily have been picked up from the seaside marram banks, upon which various beetles abound in the summer months. Other locally procured Gallinules' gizzards have contained white sandy particles, and this to such an extent as the birds would have found a difficulty in picking up piece by piece in the vicinity of our inland waters, however necessary for their digestion. It may be urged, in contrariety, that sea-worn pebbles would be useless for such a purpose; but all our subsoil sand, wherever it does crop up, has the edges similarly rounded off. The three other 1897 birds were shot around Barton Broad on July 21, August 3, and September 11,—the places where they met their ends being some two or three miles farther west than Hickling, showing that these five birds were working away from, not towards, the coast.

As to no Porphyrios having been met with in the months of February, March, April, or May, this fact cuts both ways, being partly for, and partly against, the migrational theory. Captives, as aforesaid, would be most restless at the periods of autumnal and vernal migration; but they would also be especially liable to escape during the wintry weather of the first three months in the year. I have made several inquiries concerning imported Porphyrios of Messrs Baily & Son, Castang, Cross, A. E. & W. Jamrach, and Zache & Co., and they have all most courteously replied. The sum-total of their evidence goes to prove that very few Gallinules, comparatively speaking, arrive in England during the first six months of the year. With some supply and demand has decreased since 1890, with others no recent variation has been observable, whilst in one case the West African trade (*i.e.*, in Green-backs) has increased within the last twelve years; and this informant states that, "unlike many of the beautiful fowl which were plentiful twenty years ago, and are not now procurable, this bold, clever, hardy, and prolific bird holds his ground and increases"; and further, "I receive most in October and November." This same writer, after expressing no wonder at the popularity of this species, goes on to state that he has known a pair thrive for three years, summer and winter, without any artificial protection. *Cæruleus* has bred in captivity in England, and has been recorded up to nineteen years of age.

There can, therefore, be no question as to their hardihood, the possibility of these birds taking care of themselves in Broadland, and breeding here too, if only they were given a chance of doing so. Five-and-twenty years ago equally strong arguments might justly have been brought against some half-dozen birds which are now included in the British list, as still resign the Porphyrios to doubtful positions. My idea is that we shall now have occurrences more or less regularly chronicled, and in a few more years this African straggler will be as thoroughly recognised as a British subject as only a few years ago such a probability may have seemed as remote as the then inclusion of our latest human South African additions to the Empire appeared to be. Meanwhile those who retain Porphyrios in a state of semi-captivity might take the time and trouble to follow out Mr Gurney's suggestion of marking their birds with permanent rings or other devices, and thus assist themselves to the identification and possible recovery of their escapes, and at the same time disprove the theory of spontaneous immigration of these two species.

In addition to the British killed birds of the species previously alluded to, there is one (stuffed) in Lord Hastings' collection in the Museum at Great Yarmouth, but no data are attached to it. Probably there are also some other mounted specimens in public museums and private possession, whose existence, however, is not chronicled in the various Natural History journals. I should be glad of notes of any such individuals.

Elatine hydropiper in Denbighshire.

By E. M. Wood.

Two summers ago I spent a short but delightful holiday away among the moors and valleys of Denbigh, in a district but little known to the ordinary run of tourists, as it lies in an obscure part of the country between the Clwyd and Conway Valleys. The country, of course, is hilly, and on this account the district is not very easily accessible, at least from one of the nearer railways—the L. & N.-W. Railway,—but more easily reached from Denbigh town, although the approach from Abergele is most attractive and picturesque. In either case the distance is not beyond the powers of a good walker, and the village carrier will always call for one's luggage at the most convenient station.

The village of Llansannan itself, where I had most comfortable "diggings" at a farmhouse, cannot boast of anything approaching architectural beauty, but the surroundings are such as to compensate for any deficiency in the buildings themselves. The village lies in a deep hollow surrounded by hills and shut away from the outer world, —a regular "Sleepy Hollow," but most attractive for this very thing to those who enjoy a quiet holiday, to those who most care to poke about in a new place regardless of conventionalities, to those whose love of the country and all things pertaining thereto is most keenly developed.

Geologically, I fancy, the country abounds in shale-rock, sharp flakes of which are not exactly easy for climbing about among. The principal river, which waters all this fertile valley, is the Aled, springing from the lake of that name, high up on the moors to the south of Llansannan, and having many tributary streamlets to join it at intervals on its course to the Elwy.

The numerous valleys which radiate from the larger and wider Aled Valley (each has its own particular purling stream) vie with each other in the greenness of their wooded banks, covered with an undergrowth of luxuriant ferns. In one special narrow valley, riddled with old shafts of lead mines, the oak and beech ferns grew in undisturbed magnificence, such as one seldom sees at the best of times. Above the green valleys the high moorlands glow with the purple of heather and the gold of gorse.

One of the most charming of the many directions one may take is the walk or drive to Llyn Aled, and the best of it is that you may go one way and return by quite a different route. This, I imagine, is always a welcome arrangement in any country ramble, if it can be done. The route by lanes first and then across the free wind-swept moors, tenanted by whirring grouse and lean mountain-fed sheep, is a grand one. The map shows that you pass by several tumuli, and then the road sweeps a great curve and takes one past a small lake from which the Denbigh water-supply is drawn; and then with a large shooting-box, Brynntrillyn, on the right, you have a grand view of the Snowdonian mountains, wreathed, it may be, with clouds and mist, whose ever-moving masses disclose now and again the depths of grey and brown of many rifts in the hillsides.

Llyn Aled is only a small lake about half a mile long and nearly half that distance across at its widest part, and the banks perfectly treeless, except for a few larches near the fishing-house at the northern end. Good fishing was obtainable up to recent years, when, if I am correctly informed, pike were introduced into the lake, and much to the damage of other fishes! Paddling about the shores, plentifully sprinkled with *Littorella lacustris*, and with indications of *Lobelia dortmanna*, in the shallow water, I was most delighted, on my memorable visit, to discover a few plants of *Elatine hydropiper*, the minute Water-pepper. This tiny plant, according to latest advices (*vide* London Catalogue), only appears in three districts or localities in the British Isles. It, with *Elatine hexandra*, belongs to the natural order Elatinaceæ, a small order with relationships to Caryophyllaceæ and Hypericaceæ. They are both annuals, growing under water, having opposite spathulate or ovate leaves, and minute greenish flowers. The two or three specimens were probably only on the margin of a greater quantity, and unfortunately I had not the opportunity of going again to the lake during our short stay, always promising myself another hunt for the little plant at a future time. I sent a specimen to Kew and had corroborative information as to the exact identity of the plant. This, of course, was the crowning joy among the plants of the district, where many others of rather less rare note grew luxuriantly.

The Aled, after its origin in its lake-mother, wanders over the moor until it plunges headlong into a deep valley over a series of rocky ledges. The "Rhaiadr-fawr," or great falls, are most picturesque, at the head of a deep rock-strewn gorge. To follow the course of the river to within a short distance of Llansannan is quite possible, but a very rough undertaking, and unless you have the guidance of some one who knows every foot of the way, certainly foolish to try. Very soon the steep rocky banks become thickly wooded and not easily negotiated, although the shady places harbour many plants, and groves of wild raspberries with their crimson luscious fruit make it worth while to risk a little rough climbing.

The ordinary road from the falls back into civilisation runs along the top of the hills, which gently slope down towards the river. On the way thither the road may be left for a detour to inspect the site of the house where William Salesbury (1520?-1600?) was born, and where probably much of his work as a translator of the Bible, Prayer-book, &c., into the Welsh language was accomplished. In his later years he wrote a work on Welsh botany, the MS. of which is now lost; but a transcript of it was within recent years in existence. Cae Du, literally Black Field, lies on the slope of the hillside, with the Aled, now a meek stream, flowing in pastoral quietude at the base. A few remnants of walls, outlining what was once a comfortable homestead, is all that remains of Salesbury's home, and goats and pigs wander about the ruins. Of the garden, laid out in a sort of terrace, nothing remains but two interrupted rows of ancient plum-trees; but whether these were coeval with Salesbury's residence there is open to doubt. The wild *Artemisia absinthium* is the only herbaceous plant left by the voracious hens belonging to the new farmhouse of Cae Du.

Much might be yet said of the numerous natural attractions of the whole district, but this may suffice as a hint of a new direction for their rambles to the lovers of North Wales.

Archæology.

S. MICHAEL'S CHURCH, GARWAY, HEREFORDSHIRE.

By Rev. P. J. Oliver Minos, Ph.D., M.R.A.S. (Lond.)

"Henricus Rex Angliæ secundus, dedit. . . . Heremitoriam de Flikamstede, pertinens ad Walsall, et totam terram suam de Lange Carewey."—Monastici Anglicani Volumen alterum, Lond., 1661, p. 551. The above quotation from Dugdale informs us that Henry II., King of England, gave to the Knights of the Temple[1] all his estate of Lange (*i.e.*, Llan as pronounced in the vernacular) Carewey[2] (B. *care* or *caer* = camp + *wey* or *wy* = water), modern Garway[3] (pronounced locally Garewy), and her church of ancient foundation.

Let us enter the Llan (originally any enclosure, afterwards a heathen sacred enclosure, and thence a church) or churchyard. Standing at the gate, one sees an old hollow yew-tree on the right hand and a younger yew-tree on the left hand, and the path by the (once wholly detached) tower to the west entrance of the church dedicated to S. Michael,[1] the warrior archangel. Yew-trees are evergreen, and they cast a dark shade. Therefore yew-tree represents *life*, and its shade *death*. Once, while awaiting the minister's approach to head the funeral procession into the church, it was the custom to rest the coffin under a yew-tree—*i.e.*, shadow of death,—or between two yew-trees—*i.e.*, gate of death and life,—or among three yew-trees—*i.e.*, faith in the Holy Trinity,—or at one end of two rows of yew-trees leading to the church—*i.e.*, through the valley of the shadow of death. The fact that Garway churchyard yew-trees are of different ages points to two periods of her church history —viz., (1) to the first foundation, when Llan became prefixed to the British Carewey, and (2) to the second foundation, or rather enlargement, of a small existing church in the reign of Henry II. (1145-1189) by the Preceptor of Garway Templars, whose arms[2] are still to be seen on the wall of the nave over the north entrance (now built up).

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[1] In 1118 Baldwin II., King of Jerusalem, granted a house on Mount Moriah, where the Temple of Solomon had stood, to the "Poor Soldiers of Jesus Christ." Hence they came to be known as Knights Templars. Compare Woodhouse on 'The Military Religious Orders,' p. 208.

[2] In the 'Liber Landavensis,' p. 502, is a copy of a grant from King Morgan Hen (contemp. Edgar, King of England, 958-975) to Gwgan, Bishop of Llandaff. Among other places is mentioned the parish of "Lannguotonoi," which a note says is probably Garway. Again, on p. 547, concerning the territory of Ergyng, mention is made of "Lannmihaegel" upon "Mingui," which a note says is probably Garway.

[3] Garway is on the river Monnow. The *care* or *gaer* is on the brow of a hill overlooking the river; hence the above "Mingui" (B. *min*=brow of a hill+*gui* or *gwy*=water).

Next, the position of the massive square-sided tower (once wholly detached from, now joined on by a *slyppe* to, the nave) arrests attention. Seeing that ample room still exists on the west end of the church, one naturally wonders at its most unusual position—viz., *diagonal to the nave* (and the temple or chapel of the Order)—*i.e.*, pointing to S.E., or rather E.S.E. The tower, no doubt, is of the same date (thirteenth century) as the Templars' chapel adjoining the chancel on the south. In this chapel, according to John de Stoke,[3] Chaplain of the Order, and Treasurer of the Temple, London, novices or recruits to the Order were received and initiated. On their reception, they took the oath of perfect obedience to the Grand Master of the Order, who resided at Jerusalem. Transgressors of this oath were punished with severity by stripes, temporary separation from the Brethren, and other penalties. Now, at this distant date, when one hears that the basement or ground-floor of the tower is still locally known as "The Prison," one naturally connects the transgressors with it. Moreover, an aperture 7 inches square and 5 feet from the ground runs through the east wall of the tower, suggesting that food was passed from the outside to the prisoners within. Therefore it would not be improbable to explain the peculiar position of the tower as looking towards the chapel of the Order, or rather *towards Jerusalem.* Such reminders are not unknown in the Bible: "Now when Daniel . . . toward Jerusalem, he kneeled upon his knees," &c. (Dan. vi. 10); "But as for me, . . . will I worship toward Thy holy temple" (Ps. v. 7); "If Thy people . . . shall pray unto the Lord toward the city which Thou hast chosen," &c. (1 Kings viii. 44); "I am cast out of Thy sight; yet I will look toward Thy holy temple" (Jonah ii. 4). In addition to these there was the rule of the Saracens daily at eventide to pray towards Mecca. Need I say that these were sufficient for the Templars to adopt some similar rule to aid unity and obedience in their Order. Again, on the E.S.E. buttress of the Templars' chapel are to be noticed two sectors (or sun-dials) —one of which is perfect, and the other imperfect. The perfect one represents a quadrant with the points from E. to S. marked; but the S.E. line is greatly prolonged and crossed to arrest attention. This sector (or sun-dial) I take to indicate roughly the position of Jerusalem, where the Grand Master of the Order resided. If it be so, then the stone-tongue confirms the above explanation as to the tower having been built towards the chapel of the Order, and towards Jerusalem.

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[1] The Briton's fondness for S. Michael curiously exemplifies the provocations they received from Roman Christianity and Saxon Paganism.

[2] The arms consist of a cross pattee with hearts connecting the ends of the beams, and on it a hand in a sunk lozenge.

[3] See 'Archæologia,' vol. xxxi. pp. 182-197.

Advancing from the tower towards the west front of the church, and on looking up at the leaning gable-end, one sees a large stone rougher than all the rest, and showing marks of some carving roughly broken off: a few courses under and more to the right, a small stone appears with a winged dragon. With the help of this I would suggest that the broken-off carving represented "the flesh," thus completing the symbolical language for "the devil, the world, and the flesh." Lower down is the west window; still lower down is the west door (slightly pointed) of the church. Not far from this door, and on the right jamb, is to be seen an incised patriarchal cross[1] on a triangular footing. What does it suggest? It can suggest only one thing—viz., that the consecrator of the church was an Eastern Patriarch. Of this, in connection with Garway, there is no record. From Dugdale we learn that Henry II.[2] gave his whole estate of Garway to the Templars; and in this reign Heraclios, Patriarch of Jerusalem, visited England and consecrated part of the Temple Church,[3] London, 1184. Can he be the consecrator of the Templars' church at Garway? Here it would be interesting to sketch briefly the consecrator's route as marked by the crosses: assuming that the procession is formed in the church, we notice it going out of the north door. The bishop as he goes out makes on the right doorpost the sign of the cross, and here is seen a small cross pattee encircled. Turning to the right, he proceeds to the east end, where he again makes the sign of the cross, and this time the cross patriarchal marks the spot. Still keeping to the right, he comes to the west door, where he for the last time makes the sign of the cross, and here again a cross patriarchal marks the spot. Then the procession re-enters the church.

On entering the church the chancel arch at once arrests attention; and, standing by the font on the left, one sees the striking contrast between semicircular Norman arch and pointed Early English arch (in the background). In a letter dated the 23rd June 1896 that eminent archæologist Mr J. T. Micklethwaite, F.S.A., wrote: "I return letter and photograph. The latter shows a very fine chancel arch of Transitional date, perhaps about 1170. The two outer orders have late forms of chevron ornament, the second being a rather complex one—characteristic of the time. I should describe the inside order as 'having its voussoirs moulded horizontally on the soffit.' It is a form which one meets with occasionally, but in turning over such drawings as I have here I have not found an example.[1] The carving of the capitals is contemporary with the arch, but I am not sure that the jamb is not older. I could not, however, speak positively as to that without seeing the place. The outer capital is a remote shadow of the Corinthian and of a type peculiar to the second half of the twelfth century. The other capital reminds one of Welsh work." The Right Hon. Lord Grimthorpe, one of the restorers of S. Albans' Abbey, on February 16, 1896, wrote: "That is certainly a very remarkable chancel arch in your church, and some fine Early English pillars."

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[1] The patriarchal cross once more appears on a large stone (17 inches by 18 inches) on the exterior of the E. wall of the chancel, but with the addition of crosslets on the two beams. This patriarchal cross is undoubtedly in memory of the consecration of the church.

[2] Henry II. had received absolution (1174) for the murder of Archbishop Beckett, on condition that he should proceed in person at the head of a powerful army to the succour of Palestine, and should, at his own expense, maintain 200 Templars for the defence of Jerusalem.

[3] The venerable structure was one of the chief ecclesiastical edifices of the Knights Templars in Europe, and stood next in rank to the Temple at Jerusalem. Search in Addison's 'Knights Templars' (London: Longman, 1842).

Garway chancel arch and the capitals, I think, display Eastern characteristics in addition to Norman. For example, the third or inside order of the arch one meets with in England occasionally; but in Eastern architecture it appears frequently (see the Alhambra arches). Again, the form of the rose at the end of the abacus is so Eastern as at first sight to arrest the attention of Prof. A. H. Sayce of Oxford, who pronounced it to be of "Persian pattern"—the usual form of English rose in architecture being that of the dog-rose. Moreover, the string of pearls on one of the capitals is set Turkish fashion. Lastly, the frequent occurrence of the lotus leaf and blossom would alone mark the influence of Eastern art.

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[1] Since the receipt of the above the Rev. H. Johnston informed me that a similar arch ornament is to be seen in Steyning Church, Sussex.

(*To be continued in our next.*)

British Field Zoology.

By various Writers.

CHAPTER I.—INTRODUCTORY.

THE series of articles under this heading, which are to begin in our next issue, are intended to bring the subject of Animal Life before field naturalists in a comprehensive way. That is, the various Classes, Orders, and Species which together make up the British Fauna will be treated from the field-work point of view mainly, whilst at the same time their other aspects will be sufficiently dealt with to complete the picture. The simplest forms of life will be studied first,—the one-celled animals—then the more complex. Minute details will be avoided as such, but will be studied where they are necessary to understand general principles.

The very first thing that the field naturalist should know about the animal kingdom is what the description of an animal involves. That is by no means such a simple matter as might appear. It may be explained by an illustration. Suppose for a moment that the observer discovers an animal which, as far as he is able to ascertain, is something which has not been described before, a new species. He is anxious to draw up a description of it to present to a meeting of some society, so that his hearers may get a complete idea of his discovery. He will probably find that the task of fully describing one animal is quite beyond his powers, and he would find this out as he went on. He would begin perhaps by stating the locality in which he found the specimen, the only locality in which it was at present known to occur. This statement is the *Geographical Distribution* or *Zoogeography* of the animal, and is one aspect of animal description. It is, in other words, its distribution *in space* as far as is known. He would then probably proceed to describe the general form and appearance of the animal, its shape, colour, possession of limbs, wings, fins, and other obvious external structures, or the absence of these. If minute in size, he would examine it under the microscope; if large, he would examine its internal structure by dissection. This is a second aspect of the animal, that of its *structure* or *morphology*. This includes both naked-eye and microscopic structures. By this study he would determine on what plan the animal is built up, and as the result of the knowledge thus gained he would be able to say whether the animal was a bird, fish, insect, and so on. This is the aspect of animals which is most studied in zoological laboratories, but which the field naturalist usually does not spend much time over. He is much more interested in recording and observing how the animal lives its life and adapts itself to its surroundings. The *functions* performed by all the structures of the body interest him more than the method on which those structures are built up. In describing his discovery from this third point of view he is describing the *physiology* of the animal, or the manner in which the functions are performed during life. This is, again, an immense subject, and he will soon find that he is quite unable to account for all that he sees. But he will soon perceive that all the functions which the animal is capable of performing are one of three kinds. They are either concerned with (*a*) *Nutrition*, (*b*) *Reproduction*, or if neither of these, they are (*c*) directed to *bringing the animal into relation with the world around* it. Every function is of one of these three kinds. Breathing by gills, lungs, or the surface of the body is a matter of keeping the body nourished, so are the various methods adopted by animals to excrete waste products, so is the circulation of blood, so is digestion.

The special means adopted to reproduce offspring constitute the *reproductive functions*, whether these be simply growing buds or more complicated methods. Everything that is not either a nutritive or a reproductive function belongs to the third group of functions, those by which the animal comes into contact with its surroundings. Sight, hearing, touch, smell, taste, consciousness, memory, thought, ideation, and so forth, are *all functions of relation.* One cannot conceive of any physiological function which is not directed to one of these three ends. So that our naturalist has now described his animal from three distinct aspects, and although that has involved much labour, it by no means exhausts the matter. A further investigation may lead him to find out that his new discovery, though now so rare, was at one period of the world's history a much more common animal. There may be many *fossil* examples of a similar creature. He must therefore describe its distribution *in Time*, or its *Palæontology*, as well as its distribution in present space. The past and present distribution of the same forms of life present some most interesting problems, and the two do not by any means necessarily coincide. Thus he has completed a fourth aspect. But then there is another. What is it that makes this animal different from all others, and justifies its being regarded as a new form to science? What characters has it which are peculiar to itself? Some of its structures are common to many animals, but some there are which no other animal possesses, and on account of these the discovery is recognised as a new species. This is the aspect of *specific characters.* Then there is an aspect which is really a combination of the morphological and the physiological, but which is such a large subject that it is regarded as a separate aspect—namely, the study of the various changes in form and function through which an organism passes before it reaches the stage of maturity. This is the *embryological aspect*, or the study of *Embryology.* Lastly, there is the *philosophical* aspect of animal life, that which studies the connection of one kind of animal with another, their relationships, their origin, their future, their association. This is the aspect of *Evolution*, which includes the study of the most fascinating portion of biology, and is largely a theoretical study as well as a practical one. It does not refer to an *individual* but to a group of individuals. We do not speak of the evolution of *a horse*, but that of *the horse* regarded as a species of animal.

Thus we see that there are more aspects of an animal that must be taken up in order to get a complete description of it than we might suppose at first sight. It is practically impossible for any one man to make himself familiar with all that is known of all these aspects even for a very few animals. Each aspect is a study so far-reaching in itself that *one* is more than most of us can manage to learn thoroughly. But it is of the greatest importance to remember that in describing an animal all these points of view must be considered before a complete description has been given.

For outdoor work the *physiological*, the *geographical*, and the *specific characters* are the most important aspects. Structure must not be lost sight of, for on that alone do naturalists classify animals, but it is studied here more in its relation to function than for its own sake. The main questions the field naturalist has to study are, what animals live in a given region, what characters make them the species they are, how are they related to other living or extinct forms, and how do they live their life?

We hope to be able to answer some of these questions, as far as our own country is concerned, in these chapters on British Field Zoology.

(*To be continued in our next.*)

Record of Species Observed.

Species.	Common Name.	Locality.	Date.	Observer.
Martes sylvatica	Pine Marten	Leicestershire	Dec. 24	H. S. Davenport
Macrorhampus griseus	Brown Snipe	Near Folkestone	"	W. K. Westrapp
Anser neglectus	Pink-footed Goose	Hebrides	" 1900	H. W. Robinson
Leucania vitellina	Delicate Moth	Kent	Oct. 11	J. F. Green
Lanius minor	Lesser Grey Shrike	Docking, Norfolk	"	G. E. Lodge
Upupa epops	Hoopoe	Near Wick	Aug.	Geo. Dickenson
Cyanecula wolfi	White-spotted bluethroat	Dungeness, Kent	Oct. 6	M. J. Nicholl
Motacilla alba	White Wagtail	Somerset coast	April 1902	F. L. Blathwayt
Anthus spipoletta	Water Pipit	Rye, Sussex	Oct. 29	M. J. Nicholl
Emberiza pusilla	Little Bunting	Durham	" 11	C. Braithwaite
Porphyrio smaragdonotus	Green-backed Gallinule	Hickling, Norfolk	" 11	A. Nudd, see 'Field,' Jan. 3, 1903
Plegadis falcinellus	Glossy Ibis (2)	Ireland	..	Williams & Son
" "	" "	Ludham, Norfolk	Dec. 6	'Eastern Daily Press'
Pyrrhula europea	Bullfinch	Shetland (2nd occur.)	Nov. 8	T. E. Saxby
Larus leucopterus	Iceland Gull	"	" 15	"
				Aug. 'Zoologist'—
Limosa belgica	Black-tailed Godwit	Limerick	Jan. 5, 1900	F. Coburn
Totanus fuscus	Dusky Redshank	Worcestershire and Warwickshire	Sept. 15, 1901	"
Ægialitis hiaticula	Ringed Plover (breeding)	Worcestershire	June 1, 1902	D. B. Grubb, and 'Field,' Aug. 2

Species.	Common Name.	Locality.	Date.	Observer.
Botaurus stellaris	Bittern (breeding)	Herts	1849	F. C. R. Jourdain
Linota rufescens	Lesser Redpoll "	Wimbledon Common	June 22, 1902	M. J. Nicholl
P. sibilatrix	Wood Warbler "	" "	"	"
M. raii	Yellow Wagtail "	" "	"	"
Anthus cervinus	Red-throated Pipit	Achill Island, and cf. 'Zool.,' 1901, p. 264	May 25, 1895	F. Coburn
				Sept. 'Zoologist'—
T. natrix (habits of, in	confinement)	.. ..	..	B. J. Horton
S. fuliginosa	Sooty Tern	Lancashire	..	C. Oldham
C. canorus	Cuckoo (notes on)	Aberdeen	May to June	W. Wilson
E. cirlus	Cirl Bunting	Carnarvon and Cardiganshire	June 1902, July 1901	S. G. Cummins
"	" "	Donegal	Aug. 2	H. E. Howard
A. gambeli (on specific	validity of, &c.)	.. ..	..	F. Coburn
				Oct. 'Zoologist'—
T. glareola	Wood Sandpiper	Orkney Isles	Sept. 1, 1902	C. S. Buxton, and 'Field,' Oct. 11
D. albirostris	White-beaked Dolphin	Yarmouth	July 12	A. Patterson
				'Naturalist's Journal,' Oct. 1902—
Ancistroyncha abdominalis	.. ..	Pool, Leeds	June	E. W. Morse
Pogonochærus bidentatus	.. ..	" "	"	"
Clytus abietis (swarm	ing on fir logs)	" "	"	"
Cicindela campestris	Tiger Beetle (common)	" "	"	"
Corymbites castaneus	.. ..	Forest of Dean	"	"
Pachyta cerambyciformis	.. ..	" "	"	"
Prionus coriarius	.. ..	" "	"	"
				'Naturalist's Journal,' Sept.—
Cordiceps miliaris	.. ..	Holmfirth	No date	No name
Meriania argentifera (n	ew to Britain)	New Forest	..	Mr Lucas
				'Naturalist's Journal,' Aug.—
Cnephalscotes elegans	(very rare)	Marsden	..	William Falconer
Microneta saxatilis	(rare)	"	..	" "
Tweticus abnormis	"	"	..	" "
Oonops pulcher	"	"	..	" "
Pocadicnemus pumilis	"	"	..	" "
	Viper, black variety	Christchurch	May 6, 1896	M. R. Brown
Peziza vesiculosa (new	to Scotland ?)	Niddrie Woods, Mid-Lothian	..	W. A. Nicholson
Grus communis	Crane	Maesycrugian Manor, Carmarthenshire	May	Miss Day
Z. unimaculatus	Eckstrom's Topknot	Great Yarmouth	Sept 20	A. Patterson, recorded in 'Eastern Daily Press' and in 'Zoologist,' Oct. 1902
				'Knowledge,' Oct. 1902—
Anser rubrirostris	Gray Lag	Limerick	Nov. 23, 1901	F. Coburn
Saxicola caterinæ	Black-eared Wheatear	Polegate, Sussex	May 28	Williams
	Scops' Owl and Ring Ouzel (nests of)	Hertfordshire	..	W. P. Westell in 'Nature Notes,' Sept. 1902
				'Field'—
C. spinus	Siskin (nest of)	Derbyshire (new to)	1902	C. R. Gurney, Aug. 2
C. cineraceus	Montagu Harrier	Baschurch	June 6	H. E. Forrest, " 9
Thecla W. album	White letter Hairstreak	Norfolk	July 25	J. H. White, " 9
C. alba	White Stork	Tooting Common	Aug. 8	P. H. Dalbiac, " 16, 23
N. caryocatactes	Nutcracker	Hereford	Nov. 19, 1900	J. B. Pilley, " 23
V. antiopa	Camberwell Beauty	London	Aug. 28	H. Mardon, Sept. 6
F. peregrinus	Peregrine (breeding)	Breconshire	1902	J. J. Neale, " 13

Species.	Common Name.	Locality.	Date.	Observer.
	Adder (swimming)	Loch Ken	Sept. 9	G. Hodgkinson, Sept. 13
M. atricapilla	Pied Flycatcher	Norwood	" 2	G. W. Nicholson, " 13
	Bats, Barbastelle and Natterer's	Surrey	1860	J. A. Bucknill, " 20
Anser segetum and arvensis	Bean Geese (good article on)	.. ..	..	F. W. Frohawk, Oct. 4
Campanula patula	Spreading Bellflower	Pulborough, Sussex	Oct. 1902	Miss A. E. Cumming
Dianthus Armeria	Deptford Pink	Petworth, "	"	" "
Limnanthemum peltatum	Fringed Buckbean	" "	"	" "
Setaria viridis[1]	Green Bristle Grass	West Marden, "	Summer 1902	Recorded by Rev. Dr Arnold
Hirundo rustica	Swallow	Hermitage, "	Dec. 4	Mr J. Day and Mr E. Caiger
Somateria mollissima	Eider Duck	Emsworth, "	" 1	Rev. Dr Arnold
Anthus spipoletta	Water Pipit	Rye Harbour, "	Oct. 29	Mr M. T. Nicoll
Mergus albellus	Smew	Chichester, "	Dec. 10	Rev. Dr Arnold
Cuculus canorus	Cuckoo	Sandown, Isle of Wight	Nov. 29	Mr P. E. Stone
Cyanecula wolfi[2]	White-spotted Bluethroat	Dungeness, Kent	Oct. 6, 1902	Mr M. T. Nicoll, St Leonards
Primula vulgaris[3]	Primrose	Ashdown Forest, Sussex	Dec. 25, "	W. Percival Westell
Geranium Robertianum	Herb Robert	Torquay, Devon	"	A. J. Nicholson, St Albans
Fragaria vesca[4]	Wild Strawberry	" "	"	
Lapsana communis[5]	Nipplewort	St Albans	Jan. 11	W. Percival Westell
Plectrophanes nivalis	Snow Bunting	Lowestoft, Suffolk	Early in Oct.	E. T. Daubeny
Picus martius	Black Woodpecker	Euston, near Thetford, Suffolk	Oct. 24	W. S. Sparrow
Linaria repens	Striped Toadflax	Between Bognor and Selsey	Sept. 1902	Mr B. Reynolds
Squatarola helvetica[6]	Grey Plover	Emsworth Harbour	" 6, 1902	Mr Prior
Papaver Rhœas	.. ..	Farncombe Hill, Duke Road, Saddlescombe	" 14, "	Miss Maud Robinson
" hybridum	Round Rough-headed Poppy			
" dubium	Long Smooth-headed Poppy			
" Argemone[7]	.. ..			
Stellaria aquatica[8]	Great Stitchwort	Petworth, Sussex	..	Miss A. E. Cummins
Verbascum Blattaria[9]	Moth Mullein	Racton, "	Oct. 1902	Mr Fielder
" "	" "	Cocking, "	"	Mr B. Reynolds
Vanessa antiopa	Camberwell Beauty	West Wiltering, "	Sept. 30, 1902	Mr Charles Fowler
Agrœcia vittipes[10]	.. ..	St Albans, Herts	July 21, "	W. Percival Westell
Ellampus truncatus, Dhlb	Chalcid Fly	Reading	June 30, 1901	Rev. F. D. Morice
Nyxeophilus corsicus, Marsh	Ichneumon Fly, new to Britain	New Forest	May and June	Claude Morley
Hæmonia appendiculata	Phytophagous Beetle	Royal Canal, Ireland	June 3, 1902	S. W. Kemp
Otiorrhynchus auropunctatus	Irish Weevil	Portmarnock	" 1902	"
Carabus clathratus	Geodephagous Beetle	Lough Neagh	May 17, 1902	"
Bembidium argenteolum	" "	" "	"	"
Aphelochirus æstivalis	Semi-water Bug	" "	"	"
Meloë brevicollis	Oil Beetle	Bolt Tail, S. Devon	April 1902	N. H. Joy
Cetonia floricola, Hbst.	Rose Beetle	Black Wood, Rannoch	June "	Prof. Beare
Aphanus Rolandri	Pachymerid Bug	Greenhithe	May "	F. B. Jennings
Amara patricia	Sunshiner Beetle	Charing, Kent	June "	"

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[1] Only previous record in Sussex in 1870, when it was found by the late Mr F. C. S. Roper at Eastbourne.

[2] First authentic British-killed specimen.

[3] Hundreds in bloom in woods on Christmas day.

[4] In bloom on Christmas day!

[5] A piece in flower. Hooker gives flowering period July to September!

[6] Several were shot; the early date of autumn migration is worth recording.

[7] All four species growing quite close together.

[8] This plant is rare in Sussex, and this is a fresh locality for it.

[9] A rare plant in Sussex.

[10] A rare grasshopper, recorded by Redtenbacher from Theresopolis in Brazil. Kindly identified by Mr Malcolm Burr. Believed to be first recorded occurrence in Great Britain, but probably imported with fruit or flowers.

Species.	Common Name.	Locality.	Date.	Observer.
Osphyra bipunctata	Heteromerous Beetle	East Gloucestershire	May 31, 1902	J. Edwards
Andrena ferox, Smith	Solitary Bee	Huntingfield, Kent	May 1902	A. J. Chitty
Stylops melittæ	Bee Parasite	" "	"	"
Acosmetia caliginosa, Hb.	Reddish Buff Moth	Isle of Lewis, Hebrides	1901	— M'Arthur
Ischnura pumilio, Chp.	Small Dragon-fly	Westport, Ireland	June 1886	J. J. F. X. King
Cionus luctuosus, Boh.	Circular Weevil	Teneriffe	1901	E. A. Elliott
Leucania flavicolor, Barrt.	Flavous Wainscot Moth	Dovercourt, Essex	July 1902	G. F. Mathew
Plusia moneta	Noctuid Moth	Pewsey, Gloucestershire	1896 and 1899	E. Meyrick
Ceropales variegatus	Fossorial Wasp	Woking, Surrey	Aug. 5, 1902	Rev. F. D. Morice
Silpha subrotundata, Steph.	Clavicorn Beetle	Isle of Man	April to July 1902	J. H. Bailey
Lemostenus complanatus, Dej.	Geodephagous Beetle	Probably common	1902	Several
Metæcus paradoxus	Wasps' Nest Beetle	Tostock, Suffolk	Sept. 1902	W. H. Tuck
Eupithecia innotata	Rare Pug Moth	Aldeburgh, "	" 10, 1900	G. F. Mathew
Crambus fascelinellus	Crambite Moth	Dovercourt, Essex	Aug. 15, 1902	"
Panchlora exoleta, Klug.	Imported Cockroach	Maxwelltown, Dumfries	1902	W. L. Distant
Bacotia sepium, Spyr.	Small Moth	Chingford	May 28, 1902	L. B. Prout
Lycæna ægon	Silver-studded Blue Butterfly	Cullompton, Devon	July 5, "	R. M. Angus
Sphinx pinastri	Pine Hawk Moth	Winchester	June 30, "	E. F. Johns
Tortrix viridana	Green Oak Moth	Everywhere, abundant	1902	Several
Luffia ferchaultella	Tiny Moth	North Shoebury	Mar. 31, 1902	F. G. Whittle
Pachnobia leucographa	Mountain Rustic Moth	Bishop Wood, York	April 14, "	S. Walker
Prionocyphon serricornis	Malacoderm Beetle	Epping Forest	June 27, "	E. A. Butler
Rhizotrogus ochraceus	Cockchafer	Cornwall	July 1902	Dr D. Sharp
Tribolium ferrugineum	Imported Beetle	Ipswich	Aug. 3, 1902	Claude Morley
Lopus flavomarginatus	Capsid Bug	Bentley Woods, Suffolk	" 4, "	"
Pachygaster ater	Bracken Fly	Foxhall, Suffolk, and Ryde, Isle of Wight	" "	"
Millogramma punctata	Parasitic Fly	Foxhall	" 10, "	"
Livia juncorum	Rush Froghopper	"	" 10, "	"
Baccha elongata	Elongate Syrphid Fly	Ryde	" 15, "	"
Megachile argentata	Silver Coast Bee	Bembridge, I.W.	" 19, "	"
Tiphia femorata	Breck Fossor Wasp	Tuddenham, Suffolk	" 28, "	"
Satyrus semele	Grayling Butterfly	Brandon, "	" 30, "	"
Corizus maculatus	Square Bug	Tuddenham Fen, "	" 29, "	"
Hylotoma ustulata	Thick-horned Sawfly	Barton Mills, "	" 29, "	"
Platycephala planifrons	Long-forehead Fly	Tuddenham Fen, "	" 29, "	"
Orchestes salicis	Sallow Weevil	" " "	" 29, "	"
Aromia moschata	Musk Beetle	Barton Mills, "	" 29, "	"
Mutilla rufipes	Apterous Wasp	Bentley Woods	Sept. 13, "	"
Leuctra fusciventris	Pearl Fly	Foxhall	" 25, "	"
Halonota bimaculata	Tortrix Moth	Bentley Woods	" 27, "	"
Gnatbocerus cornutus	Flour Beetle	Ipswich	Oct. 8, 1902	.. ..
Colias edusa	Yellow Butterfly	"	" 19, "	.. ..
Orthochætes setiger	Rare Weevil	Bentley Woods	Nov. 2, "	.. ..
Meteorus filator	Rare Braconid	" "	" "	.. ..

The Field Naturalist's Library.

REVIEWS OF BOOKS, PERIODICALS, ETC.

SCHOOL OF THE WOODS. By William J. Long. London: Ginn & Co. Price 7s. 6d.

The two works by this author noticed in our last issue—namely, 'Beasts of the Field' and 'Fowls of the Air'—led us to expect great things from the same pen, but we were not quite prepared for anything quite so good as the volume now before us. In our opinion Mr Long is entitled to rank as the greatest living nature writer, and this work, if we mistake not, will make his reputation an enduring one. It is quite impossible to do the book justice in the space at our disposal, and we have taken other steps in this number of the F. N. Q. to indicate some of the attractions here set before us.

The fundamental thought which underlies all the delightful observations recorded in these pages is that the habits of wild animals are not due to instinct, as is so commonly supposed, but are the result of long and careful training of the young ones at the hands of their parents. The part of heredity is a small one, the effect of early training the important factor. Mr Long adduces many detailed examples of these nature lessons given to young animals by their parents which he himself has watched, and which in our opinion amply justify his view. It is summed up in the following paragraph: "The summer wilderness is just one vast schoolhouse, of many rooms, in which a multitude of wise, patient mothers are teaching their little ones, and of which our kindergartens are crude and second-rate imitations. Here are practical schools, technical schools. Obedience is life; that is the first great lesson. Pity we men have not learned it better! Every wild mother knows it, lives by it, hammers it into her little ones. And then come other, secondary lessons—when to hide and when to run; how to swoop and how to strike; how to sift and remember the many sights and sounds and smells of the world, and to suit action always and instantaneously to knowledge,—all of which, I repeat, are not so much matters of instinct as of careful training and imitation. Life itself is the issue at stake in this forest education; therefore is the discipline stern as death. . . . Yet tenderness and patience are here too, and the young are never driven beyond their powers."

We would not anticipate the pleasure of the reader by quoting the examples described as illustrating the argument; they are, as we say, convincing and surpassingly interesting. Mr Long has earned our gratitude in thus describing what he has so carefully watched in the lonely woods; and he has been ably assisted by the skilful pencil of Mr Charles Copeland in the numerous illustrations which form a prominent feature of the book. Two chapters in the work are of more general import than the individual animal studies: these, we are glad to note, properly belong to a promised volume of nature essays, the appearance of which we eagerly anticipate. One of these chapters we have the privilege of publishing as an article in this issue, that entitled "How the Animals Die."

We are glad to have seen the welcome accorded to this book by the general press in this country, and we hasten to add our meed of praise on behalf of field-naturalist readers, to whom it will prove a delightful possession.

THE NATURAL HISTORY AND ANTIQUITIES OF SELBORNE. By Gilbert White. Edited by L. C. Miall and W. Warde Fowler. London: Methuen. Price 6s.

Another excellent edition of the famous work of Gilbert White. The whole of the original edition of 1789 is here reproduced except the Appendix of Latin charters and deeds. The Observations on various parts of nature, extracted from White's diaries by Dr Aikin, are included, but it has not been thought worth while to add the Naturalist's Calendar which Dr Aikin compiled. Gilbert White's spelling and punctuation are scrupulously retained, except that his few errata and misprints are rectified, notice being given of all the important corrections. His original notes are all reprinted. In addition there are copious notes by the editors, all those on the birds being by Mr Warde Fowler. White's index has been augmented by the editors, the whole index to this edition being now extremely good. The introduction of 36 pages by the editors deals with the author's life and history, his friends and correspondents, the natural aspects of the Selborne locality, the history of the book, the author's view of bird migration, and such explanatory topics. The feature of the edition is the profusion of excellent editorial notes, and the extension of these to the Antiquities. The volume is not illustrated. The other edition noticed in this issue is illustrated, and omits the Antiquities. In a footnote on p. 42 of this edition the editors state that the Green Lizard (*Lacerta viridis*) is included among the reptiles "now known as British." Eight pages later they state that it has not been found "in Great Britain or Ireland." Neither of these notes is quite correct. The Green Lizard is not indigenous to Great Britain, though it has not infrequently been found, such captures undoubtedly being escapes. But in the division of this country into Biological Provinces, which is now recommended by authorities on our fauna, the Channel Isles are included as a Province, and in this sense the Green Lizard is British. But until this method of describing the distribution of our animals is well understood it should always be made clear that the inclusion of the species named is upon this ground only. Doubtless some of the lizards mentioned by Gilbert White as Green Lizards were of the Sand Lizard species, *Lacerta agilis*.

As we have said, the notes in this edition which are appended to the "Antiquities" portion are particularly good, and we have no doubt that the book adds one more to the already large number of editions which will be readily welcomed.

THE NATURAL HISTORY OF SELBORNE. By Gilbert White. (With Notes by R. Kearton, F.Z.S., and 123 Illustrations from Photographs by Cherry and Richard Kearton.) London: Cassell & Co. Price 6s.

The field naturalist—if there be one—who has still to add 'The Natural History of Selborne' to his library cannot complain of lack of choice as to the edition he may obtain. To the eighty odd already in existence, two more are to hand, both good in different ways. The feature of the edition now under notice is of course the fact that it is profusely illustrated by the Kearton Brothers, who have done so much in recent years to bring animal and nature illustration to the perfection we now find. They have here done a great service to all lovers of Gilbert White, and have evidently made themselves very familiar with all the scenes he loved to write about. The footnotes added by Mr R. Kearton are nearly all by way of confirmation of statements by the author, from the editor's own experience; others are explanatory, a few corrective of mistakes. They show all the freshness of first-hand observation which we look for from Mr Kearton. Mr Kearton has omitted the Antiquities from this edition, which we think was as well: it is convenient to have a well-illustrated edition dealing with the Natural History alone. Numerous other editions supply the antiquarian's want. The book is sure to be a very popular edition of the old classic.

THE FIELD NATURALIST'S HANDBOOK. By the late Rev. J. G. Wood and the Rev. Theodore Wood. London: Cassell & Co. Sixth Edition. Price 2s. 6d.

The authors of this valuable handbook assume that the three favourite branches of zoology with field naturalists are those of Entomology, Botany, and Ornithology, and they are doubtless perfectly right. In addition to this fact, however, there is another very good reason for restricting a book on this plan to the departments named, and that is that our knowledge of indigenous mammals, fish, and possibly reptiles and amphibians, is not sufficiently perfect to admit of the cut-and-dried treatment necessary here. Still we cannot help regretting that no mention of any kind is made of these latter branches; it is precisely in those subjects that there is so much room for observation. This work limits itself to well-ascertained facts, and arranges those facts in a manner which indicates at once to the field naturalist when and where he may observe them for himself, and in so doing renders a most useful service to the member of a field club.

The plan of the book is simple. Each month of the year is taken successively, and the reader will find a complete catalogue of all the Butterflies and Moths—the Lepidoptera only are dealt with in Entomology—which appear in that month, together with the plants that are in flower and their localities. Also there are notes of the egg, caterpillar, and pupa of each insect, so that each insect life-history is gathered at a glance. The food-plants of caterpillars are added, so that those wishing to rear caterpillars will find their requirements in the botanical part of the book.

Full directions are given on the methods most in vogue for catching Moths and Butterflies, the localities most frequented being described as well as the procedure for treacling, beating, &c. The approximate stay of each bird in England is stated, together with the locality of its nest, and average number of eggs. Plants are arranged according to the months in which they flower.

All the information is exactly that required by the ordinary field worker, who will find this book an invaluable guide to his work, and one which will enable him to overcome many practical difficulties. Mr Wood advises the moth-hunter to take the local lamp-lighter into service, a distinctly good idea; but our author seems to have met with trouble from the police force, for he complains that "Bobby" does not understand the desire of the entomologist to climb street lamp-posts for anything less than half-a-crown. No smaller sum, we are assured, will persuade him that you have no felonious intentions. This information is doubtless valuable, but the book would lose little by its omission. Referring to the space required in cabinets, Mr Wood says that a very small amount will suffice for the Large Copper Butterfly: presumably he means that the collector will not be able to afford to purchase many, the species having become extinct since about 1848, as our readers will recollect from an article on it in our last issue.

An interesting paragraph is that on the difficulty of killing some insects,—the movements after extraction of the abdomen, injection of poison, &c., being very remarkable in some cases. Mr Wood terms these movements "reflectively muscular," meaning, we presume, "reflexly." Whether reflex or not, there is certainly no reflection on the part of the insect in these cases.

We cordially recommend this compilation to all field workers; it will prove of the greatest assistance on very many points.

A FIRST BOOK OF FORESTRY. By F. Roth. London: Ginn & Co. Price 3s. 6d.

We have but one fault to find with this interesting book, and that is the irritating way in which the author is constantly issuing invitations to his readers to "Let us" do something or other. Such expressions as "Let us take a stroll," "Let us break through," &c.; "Let us walk on," "Let us examine," "Let us count," "Let us look,"—the last three within seven lines,—"Let us dig," "Let us count" again, "Let us go," "Let us now see," are scattered wholesale throughout the work, and detract somewhat from the pleasure of continuous reading. But the matter, apart from the style, is excellent. Part I. deals with the effect of light and shade, soils, moisture, heat and cold, and mountains on the forest. Part II. treats of raising and keeping up the forest, its care and protection, its uses, business, and special kinds of forests. Part III. is devoted to such related topics as the value of forests as protective cover; the structural, physical, chemical, and other properties of woods; also how to distinguish our common trees. There are three appendices, the first being the Doyle-Scribner Log Scale for estimating the number of board feet in a log of given diameter. On p. 96 is a table showing the six principal methods of tree reproduction, and the trees and soils applicable to each. Landowners who derive much of their income from timber would do well to impress upon their agents some of the advice in this book. For instance (p. 139), "To leave firewood in large piles in the woods is always a bad policy, for nearly all kinds of wood commence to decay under such circumstances, and perishable woods, like beech, maple, and birch, will lose as much as 25 per cent of their value in one year." The amount of waste from this cause in British forestry must be enormous. We could quote many other paragraphs of much practical and theoretical interest, but one must suffice. Referring to the great strength of wood, Mr Roth says: "To crush a cube of dry wood 1 inch each way, with the fibres on end, requires about six to ten thousand pounds pressure. It requires only about one-third to one-half as much if the piece is soaked, or if it is green; for seasoned timber is always stronger than green timber of the same kind. To pull it apart lengthwise, wood requires about twice as much power as to crush it endwise; but to pull it apart sidewise, as when we pull out a mortise, requires only about one-tenth as much force as to crush it endwise. Most conifers break without much bending; but elm, hickory, &c., are strong and yet bend far before they break. We call them *tough woods*."

The book is profusely and well illustrated, and forms a most useful handbook to all whose business is in the woods on account of the trees.

THE ENGLISH LAKES. By F. G. Brabant, M.A. London: Methuen & Co. Price 4s.

A most compact account of the scenery of the Lake district and the routes by which it can best be seen. The Lakes themselves have been taken as centres, and the scenery grouped round them, so that the attention is focussed on each lake in turn. In addition to this, the literary and historical side of the district has been dealt with somewhat fully, at the same time keeping the book well within the compass of the pocket. A number of excellent maps are added, and Mr E. H. New is responsible for some pleasing illustrations. We are glad to find Mr Brabant drawing marked attention to the view from Tarn Hows near Coniston. We quite agree that "the whole scene is unique in Lakeland, no other tarn resembling it at all." "All round it the great mountains stand in a kind of half-circle, the Langdale Pikes being specially impressive." We also agree that it is extremely easy for a cyclist to break his neck on the road from Ambleside over Kirkestone Pass, and we have vivid recollections of an exciting gallop down that road under charge of a driver who had imbibed rather more freely than the nature of the road justified. However, those on board were unanimously agreed that "Bill" drunk was more likely to get us down safely than any one else sober, and so he did.

Visitors to Lakeland will find this a most reliable and interesting guide-book, whether their journeys are taken on foot, cycle, or coach. Nothing of interest or importance seems to have been omitted, and the size, as mentioned, is very convenient.

THE STORIES MOTHER NATURE TOLD HER CHILDREN. By Jane Andrews. London: Ginn & Co. Price 2s. 6d.

Another of the delightful books for children, of which there are now fortunately so many to choose from. This one is a collection of articles which appeared in 'Our Young Folks' and 'The Riverside Magazine' shortly after the publication of 'The Seven Sisters,' by the same writer. Before Miss Jane Andrews died she had expressed her intention of thus collecting the stories, and had chosen the title here given, and her intention was carried out by her sisters. A great part of the book is based on real events which the writer was in the habit of utilising to illustrate the beauty and nobility of everyday life. There are fourteen stories in all, beautifully told in simple language, and eminently suitable for reading aloud to children. The story of the insect metamorphosis, told under the heading of "The New Life," is particularly well done, but all are good. "Sixty-two Little Tadpoles" tells the life-history of the Amphibians very simply, yet quite accurately, in a way that must be very suggestive to the inquiring mind of a child. Other stories tell of Frost, Plants, the Sea, &c., in the same interesting manner.

EYES AND NO EYES. By Arabella B. Buckley. London: Cassell & Co. Price 3s. 6d.

We have experienced great difficulty in getting an opportunity to notice this book. With the view of testing the feelings of the readers for whom it is intended, we put it into the hands of an intelligent maiden of six years of age who had just learned to read. Since that time it has been impossible to get it back for more than a few moments, and finally we have had to carry it away surreptitiously for an hour after the maiden had disappeared for the night. But if Mrs Fisher could have seen—as we hope she has seen in the case of other children—how it was enjoyed and appreciated, we feel sure she would have wished for no further reward for writing it. It seems to us that any criticism is, under these circumstances, beside the point, if not impertinent. The book is intended to interest children in country life. It does so intensely: *Q.E.D.* There is no need to say more, but we may add that the illustrations are good and interesting, the only fault being that the coloured plates do not appear opposite their descriptions, which the authoress evidently also regrets. In a future edition we should prefer to see the book paged continuously throughout. Parents and teachers may give this book to children in full confidence that the little ones will be delighted with the gift. In addition to that, it will stir up the donors to more careful thought on many simple but fascinating points of natural life.

EARTH AND SKY. By J. H. Stickney. London: Ginn & Co. Price 1s. 6d.

A first-grade Nature Reader and Text-book, Part II. of which we noticed in our last issue. The aim is to suggest the entire world as it lies about us in our infancy, and to guide the child into the pathways of botany, zoology, astronomy, &c. The reading exercises deal with a great variety of topics, the object of this being to awaken interest in observing nature rather than to communicate facts,—to open the way for later teaching rather than to force it prematurely. The result is a great improvement on the idiotic sentences so often to be found in the first reading-books so frequently put into the hands of children who have just learnt to read simple words. The illustrations are plain and to the point. Miss Stickney has done the children a good turn in giving them these early text-books.

AGRICULTURAL ZOOLOGY. By Dr J. Ritzema Bos. London: Methuen. Price 3s. 6d.

This is one of the volumes of the Thaer Library, written to provide agricultural colleges with a condensed review of the entire animal kingdom as it specially affects agriculture. It is translated by Professor J. R. Ainsworth Davis, and has an introduction by the late Miss E. A. Ormerod.

The author, being confined to a certain size, has had to condense his remarks within a rigid compass; the domesticated farm animals are omitted,—they are dealt with by the lecturer on stock-breeding, in those institutions which the book is designed for,—and the animal foes of agriculture are dealt with in more detail in the author's larger work, 'Animal Foes and Friends.'

In the pages of the present volume a very serviceable amount of information will be found to be embodied. The chief characteristics of the animal kingdom are given, from the Vertebrata to the Arthropoda. The Vermes follow: the eel-worms, which injure crops so much, and the intestinal tapeworms and the liver-fluke, receiving special attention. The Invertebrata, lower in the scale than those just mentioned, are but briefly mentioned. More than 100 pages of the book are devoted to insect pests, and this is by far the best part of the work. A handbook such as this, in which the agricultural reader can turn at pleasure to the history of any common farm animal—be it Weasel, Vole, Wood-pigeon, Rabbit, Slow-worm, or Frog—in addition to the insects, ought obviously to be of no little service to those for whom it is intended. The book contains 155 illustrations. The list of pests in the appendix, classified according to their habitat, is not the least useful item in the book.

THE NATURAL HISTORY OF ANIMALS. By Prof. J. R. Ainsworth Davis. London: The Gresham Publishing Company. In eight half-volumes. Price 7s. each.

We have received the first half-volume of this illustrated work on Natural History, the succeeding parts of which are promised quarterly. Judging by the first part, field naturalists who are thinking of adding a complete work of this kind to their library will be well advised to subscribe for the series. We shall have opportunity as the volumes come to hand of detailed notice, and would simply now indicate the plan and scope of the work. Prof. Davis notes that "signs are not wanting that at the present time a revival of interest in Zoology is taking place, and this book is an attempt to help on the movement by pointing out the various lines of study and explaining in simple language the views of modern specialists." That, we take it, is what field naturalists particularly want. Every effort seems to have been made to treat the subject in such a way as to interest the general reader, but at the same time the standard of that interest is rightly assumed to be a high one. The subject is treated in a comparative manner, function being taken as the basis. Classification is first sketched, so as to familiarise the reader with the chief groups of animals, external characters being specially dealt with. Special attention is given to familiar forms,—the native fauna and those animals seen in zoological gardens. This first half-volume is entirely devoted to Classification and the Characters of the Vertebrate Animals. This will be followed by the Characters of the Invertebrates. Then will come a section on Food and Feeding of Animals, including the description of how they get their living ; then Animal Defences, or how they protect themselves, will be taken up ; Breathing and Movement then follow, this section explaining the adaptations of animals to air and water as well as underground life ; Development comes next, under which heading life-histories will be given, after which such subjects as the Care of Eggs and Young, and Animal Homes and Dwellings, will receive attention. Sections on the Nervous System and Sense Organs, Intelligence, Association of Organisms, Commensalism, Mutualism, Utilitarian Zoology, Distribution in Space and Time, and Philosophical Zoology (including Evolution), are the subjects which are indicated as completing the work.

From this sketch it will be seen that Prof. Davis intends describing the animal world from every point of view. The price of the work strikes us as extremely moderate, considering the size of the books and the wealth and character of the illustrations. Some of these are coloured plates, some diagrams, the bulk drawings of animals. Specially good are the series of Studies from the Life by Mr Lascelles.

As said above, we shall deal with the details of the work in future issues, our object here being to point out the plan and scope of this excellent undertaking to our naturalist readers.

WHO'S WHO AT THE ZOO. By L. Beatrice Thompson. London: Gay & Bird. Price 5s.

This book is not a scientific description of the inmates of the Zoo, nor yet is it a guide to the respective departments, both of which tasks have been done by others. The work is a pleasantly written account of recollections, incidents, reflections, &c., which resulted from many hours spent there by an artist student. It is, as one would therefore expect, profusely illustrated by the authoress from her own sketches, not from photographs. Some of the drawings are extremely good, but we do not think the portraits of the keepers are at all flattering, notably that of Tyrrell.

The greater part of the book (120 out of 166 pages) is devoted to the Mammals, most of which are figured, and concerning some of which

Miss Thompson has many interesting experiences to relate, some of them very amusing, A short chapter is devoted to the Reptiles, the remainder of the book being given to the Birds. The Monkeys are cleared of the popular aspersion on their character of being afflicted with fleas, the writer stating that "nothing living could be cleaner than the delicate bluish skin of a monkey, which . . . is seen to be absolutely free from parasites." The favourite occupation of the Monkey which suggests the vulgar error is "literally nothing more or less than the equivalent of the use of a brush and comb to a human being." The process of hairdressing is described in detail. This seems to destroy the quaint remark of Josh Billings, that a monkey scratches himself "as natural as a district schoolboy, *and undoubtedly for the same reason*."

Of the many interesting incidents recorded, the following is one of the most amusing: "Art students are not allowed to draw in the Gardens after three o'clock; and one day, being absorbed in my work, I should have been belated had I not had a curious hint to go. A quiet, insinuating voice just behind me asked, 'What's the time?' Turning round, and perceiving that it was the hyacinth-coloured Macaw who had spoken, I took out my watch and said solemnly, 'It's 2.45.' 'Eh?' said the Macaw, putting his head on one side. 'It's a quarter to three,' I repeated. 'It's a quarter to twelve,' he contradicted emphatically."

It would not be fair to criticise this book from a scientific standpoint; it is not the point of view of the writer, nor will it be that of her readers. As a most entertaining description of many of the Zoo inmates, their antics, appearances, and habits, it will be welcomed by a large circle of people who go to the Zoo to see animals and to be interested, rather than for special instruction. It will also make an excellent gift-book for boys and girls with a love for the Zoo.

'KNOWLEDGE' DIARY AND SCIENTIFIC HANDBOOK FOR 1903.
London: 'Knowledge' Office. Price 3s.

The third volume of this Diary is a very useful production for all engaged in scientific—particularly astronomical—work. The astronomical summary and account of the celestial phenomena for 1903 are revised throughout, and the paths of the principal planets are again illustrated by specially made charts.

A whole page is devoted to each day, thus giving room for real work to be recorded. Most diaries have far too little space per day, and we should be sorry to see the daily space in this Diary reduced. The greatest drawback, in our opinion, is the lack of interleaved blotting-paper. The space given for letters received and despatched might be added to each month, as people who use a book of this sort are generally great correspondents, and four pages is quite inadequate for this purpose per annum.

The volume contains articles on practical work with the spectroscope; observation of variable stars; choice of a microscope; systematic botany; meteorological observations; twelve star maps, showing the night sky for every month; a calendar; and a mass of other useful information. Altogether, an excellent companion for the scientific student's desk.

NATURE STUDIES (PLANT-LIFE). By G. F. Scott Elliot, M.A., B.Sc. London: Blackie & Son. Price 3s. 6d.

"Every detail in the structure of a plant has both a history and a meaning. My aim has been to point out how the student of nature can follow part of the history and discover the meaning." The book "has been written with the view of helping those non-professional lovers of Nature Study who are really interested in the mystery of plant-life." "All students of plant-life . . . are appalled at botanical language. Too often they obtain the impression that the mere description of a plant, or part of a plant, in scientific terms, constitutes the end, instead of the very beginning, of the Science of Botany."

The above quotations show clearly the spirit in which this excellent little book has been written, and there is no doubt that the author has put his finger on the weak spot in botanical teaching as a rule. One of the best chapters is that on Microbes, Moulds, and Yeast, in which a very clear description is given of the main functions of these organisms. Mr Elliot classes all the microbes as plants, but in the case of the lower forms it seems better to us to regard them as below both true plants and animals, a group possibly occurring before any differentiation had taken place into plant and animal. Ferns, Fern Allies, and Fossils is the title of another very interesting chapter. The illustrations, some of which are from photographs, are good, and altogether we anticipate that this book will become a favourite with field botanists.

OBSERVATIONS ON POPULAR ANTIQUITIES. By John Brand. London: Chatto & Windus. Price 3s. 6d.

One cannot but admire the industry necessary for the compilation of the 800 odd pages of information in this book. An examination on its contents would be a formidable undertaking indeed: but the work is not one to be read and learnt, it is rather a book of reference to a multitude of subjects. It is quite impossible to even mention a tithe of them, but it may be stated generally that they chiefly illustrate the origin of our common customs, ceremonies, and superstitions. Among the saints' days and other festive occasions are some titles which probably very few people know—for example, St Blaze's Day, Hoke Day, St Vitus's Day, St Roch's Day, and many others. The associations of all these are dealt with in a most interesting manner. A number of Marriage Customs, Customs at Deaths, and Drinking Customs are explained; whilst another section deals with a large number of Sports and Games, and their origin and significance. Field Naturalists, who of all people are apt to interest themselves in the customs of their respective counties, will find this book a veritable mine of curious and out-of-the-way information.

OPEN-AIR STUDIES. By Prof. Grenville Cole. London: Griffin & Co. Price 8s. 6d.

This is an introduction to field geology, the kind of work that we have often been asked for by field naturalists. The first chapter is chiefly a reminder of what may have been learnt at school, but if not, must be learnt before proceeding; but the main part of the book is addressed to those who are willing and anxious to look out upon the world, to those who spend their holidays in walking, cycling, or travelling in any sense from home. In this new edition some illustrations are added, and the whole revised. The subject-matter is divided into the Materials of the Earth, A Mountain Hollow, Down the Valley, Along the Shore, Across the Plains, Dead Volcanoes, A Granite Highland, The Annals of the Earth, The Surrey Hills, and the Folds of the Mountains; which will give the reader an idea of the ground covered. Field naturalists who take geology for their study will find this an excellent book from which to get a clear idea of the fundamental principles of the science, together with many examples of them.

THE BOYHOOD OF A NATURALIST. By Fred. Smith. London: Blackie & Son. Price 3s. 6d.

A second edition of a book for young naturalists which has evidently been appreciated. In spite of its success the author still prefers to hide his identity under the name of Smith, which we think is a pity, but which is his own business. He argues that in this book he is still the boy he was forty years ago, and that his present identity has nothing to do with that personage, a point of view that there is no getting away from. The work is a most pleasing description of encounters with the kinds of animals that boys delight in at one period or another—marine menageries, aquarium dwellers, butterflies, &c. An excellent gift-book for an enthusiastic boy naturalist.

In our last issue we stated that Mr Percival Westell's book on the 'Early Life of the Young Cuckoo' was published by Messrs Drane. The publisher is Mr Thomas Burleigh, 376 Strand. We regret the error.

One or two reviews of books received are unavoidably held over to our next.

CONTEMPORARY NATURAL SCIENCE PERIODICALS.

In the hope that it may be of service to our readers, we here briefly mention some of the more important contributions in such of our contemporaries as are sent to us. We regret that space forbids a more complete list.

Field naturalists who love microscopic work—and all should do so—will find a great deal of help in the Microscopy column in KNOWLEDGE, conducted by M. I. Cross. This excellent journal makes a special feature of microscopic work, and we are glad to direct attention to it. Of the most interesting articles in the last quarter in 'Knowledge' the following will repay perusal amongst others: Animal Wind-Bags, by W. P. Pyecraft; The Nobodies, a Seafaring Family, by Rev. T. R. R. Stebbing; Familiar Wild Flowers and their Allies, by R. Lloyd

Praeger; Insect Oddities, by E. A. Butler; Two Fashionable Furs, by R. Lydekker; Ornithological Notes, by Harry F. Witherby; and Microscopy and Astronomy, as above mentioned.

THE AVICULTURAL MAGAZINE always has some article of interest in it, and the January issue is unusually good. Birds in Towns, by J. Sergeant; A Modern Noah, by Rev. C. Farrar; and Mr Bonhote's paper on Bahama Birds, will be read with pleasure and profit. The coloured illustration of the same issue is the Yellow-Eyed Babbler, well done as usual in this paper.

THE NATURALIST, the North of England monthly journal, has now come under the editorship of Mr T. Sheppard, F.G.S., and Mr T. W. Woodhead, F.L.S. In their hands it will doubtless maintain its reputation. The January number has an article by W. G. Smith on Botanical Survey for Local Naturalists' Societies, which contains sound advice for such bodies; while Mr George Massee contributes a paper on The Modern Method of Studying Agarics. Many interesting items are recorded in the Field Notes column of this journal.

THE ANNALS OF SCOTTISH NATURAL HISTORY, for January, has some further notes by Mr Eagle Clarke on Some Interesting Birds at Scottish Light-Stations; the continuation of Mr Harvie-Brown's Avifauna of the Outer Hebrides; records of Insect Fauna of the Clova Mountains (J. C. Willis and I. H. Burkill); and Prof. Trail's continued list of Scottish Rubi. Mr Wm. Evans writes on the Sooty Shearwater in the Firth of Forth, and there are a number of interesting Zoological Notes as usual.

THE NATURALISTS' JOURNAL is now issued under the title of NATURE-STUDY. This is a decidedly clever move on the part of those responsible, as it expresses a sign of the times. The last issue deals particularly with the objects and plan of the journal.

Field Clubs and Societies.

Woolhope Naturalists' Field Club.—The annual winter meeting for the election of president and officers for the ensuing year was held in the Woolhope Club-room on December 17th. Mr H. Southall, of The Graig, Ross, was elected president for 1903. Four vice-presidents elected were: Rev. Sir George Cornewall; Rev. C. H. Binstead, of Breinton; Colonel J. A. Bradney, of Talycoed Court, Monmouth; and Mr G. W. Marshall, of Sarnesfield Court, Weobley. There was no change in the constitution of the committee or other officers of the club. Dr Gerald Leighton, who has recently left the neighbourhood, was elected an honorary member of the club. The names of four candidates for ordinary membership of the club were proposed and seconded.

It was considered appropriate that the annual address of the president (Mr Blashill) for the Jubilee year, which address was delivered at the annual spring meeting on 3rd April 1902, should be incorporated in the Transactions of the Jubilee year, 1901.

A type-written copy of the earliest papers of the club (dating from 1852 to 1865) was presented. The publication of these papers and of the transactions of the club connected with its early origin was approved, with the expression of the desirability of incorporating the earliest printed six numbers, which were issued in pamphlet form. The first originally bound volume of the club is dated 1866, and treats of the transactions of the year 1866. It is a valuable and a rare volume, containing as it does the first part of the Flora of Herefordshire, a map of the county divided into fourteen botanical districts, and notes on the geology of each separate district by the Rev. W. S. Symonds, F.G.S., &c., which latter was more recently revised and amplified in 'A Flora of Herefordshire,' issued in 1889. It is expected that the volume of Transactions, now in the press, richly illustrated with local objects of which it is desirable to retain a permanent record, will be issued, at an early date, free to all members who have paid their annual subscription for the ensuing year 1903.

The Seventh Report of the Southport Society of Natural Science records the admission of 25 new members in the year, bringing the total up to 141 ordinary members. At the evening meetings papers have been read or lectures given on the Southport Electricity Works by D. Edmondson Benson; Greek Architecture in Sicily by J. Noton; British Snakes by Dr Gerald Leighton; New Stars by Rev. A. L. Cortie; The Spectroscope by T. Thorp; A Neolithic Instrument by G. W. Chaster, M.R.C.S.; and Caves by the new president and late hon. secretary, Mr Harold Brodrick, M.A. The Report includes a list of the Lepidoptera of Southport and District by E. Basil Hobson. We congratulate Mr Brodrick on the flourishing state of the society.

Volume vi., Part II., of the Transactions of the Natural History Society of Glasgow contains in its 100 pages some important contributions to local natural science. The most important of these are—Extracts from Ornithology of Glasgow, by the late Dr John Grieve; The Seals, Whales, and Dolphins, of the Clyde Area, by Hugh Boyd Watt; The Weather of 1900 and its Effect upon Vegetation, by J. Whitton; Additions to List of Scottish Coleoptera, by Anderson Fergusson; and Notes on the Marine Deposits of the Firth of Forth, by F. G. Pearcey. In addition to these there are numerous other papers of much interest. A membership of over 350 indicates a very active interest in natural science work.

The Transactions for 1902 of the Caradoc and Severn Valley Field Club record the results of six excursions and eight other meetings.

This society has an annual Long Meeting, lasting six days, which always strikes us as not only a most excellent and enjoyable institution, but also an indication of great vitality in the members. Last year the scene of the Long Meeting was Criccieth and its vicinity. Much good work is recorded in these Transactions, particularly by the hon. secretary, Mr H. E. Forrest, who is engaged in the compilation of a Fauna of North Wales, a task of considerable difficulty and magnitude. A valuable paper is that by Mr Horwood on the fauna of the district round Marrington Hall, the borderland of Salop and Montgomery. Little had been done on this locality previously. The membership of the club now stands at 173.

Correspondence.

Reptilia.—"Will you allow me to thank you for your most explicit article on the young Adders and the 'ovary'? In common with many others, no doubt, I have now a tolerably clear idea of the naked-eye appearances one may expect to find towards the end of gestation, and am glad to find I was not mistaken in supposing that young Adders 5 inches long do not dwell in the ovaries of their mothers. Might I suggest that an article on the transmission of acquired characters in animals would prove of value to readers of the F. N. Q.?"—"OPHIS."

(We propose dealing with "acquired characters" in some future issue.—ED. *F. N. Q.*)

The Duty of Field Clubs.—"I have been a member of a well-known field club—one before which the Editor of the F. N. Q. has lectured—for some years, and I have regularly attended its summer excursions and its winter lectures. I cannot recollect a single meeting at which any attempt has been made to expound the scientific principles upon which our work is based. There is no more urgent want in these societies than this, and I rejoice that the subject has been urged upon secretaries in your last editorial. In my own particular Society there are some well-known specialists who do most excellent work,—and who would do it whether they were members or not,—but no effort has ever been made, to my knowledge, to help the general run of members to get a clear grasp of the great general laws of biology. I feel sure I am voicing the opinion of many field naturalists when I say that any efforts which the F. N. Q. makes to help in this direction will be warmly appreciated. Most of us are busy men who have no time for systematic scientific reading, and who join these clubs in the hope of gaining from our more learned brethren the knowledge of science which we were never taught. Now that attention has been directed to the point, I trust our officials will make it their duty to help us more in this direction in future."—"FIELD NATURALIST."

Attacked by a Stoat.—"I was recently the victim of an encounter which I confess I should hardly have credited if it had been related to me. It was as follows: About 4 P.M. on September 13, 1902, I was sitting at the table in a front room of my house, which stands in its own grounds and is close to a wood. I felt something crawling up my right leg, Naturally I looked to see what it was, and, to my surprise, saw the head of a Stoat on my knee, and the animal in the act of making a spring towards my throat. I knocked it off at once and killed it with the help of an Irish terrier which was in the room. I was quite alone, but at once called my son, who came and cleaned up the blood. I had the Stoat skinned, and its skin now hangs on the wall, measuring 18 inches in length. If you think the incident worth mentioning in the F. N. Q., by all means do so. I have mentioned the affair to gamekeepers and others who have lived all their lives in this country district, where Stoats are common, and none of them ever heard of such a case."—WM. FREEMAN, Grosmont, near Hereford.

(Our correspondent will be interested in Mr Cumming's letter below. —ED. *F. N. Q.*)

Attacked by a Weasel.—"One summer evening, accompanied by my son, I was returning home after having spent a pleasant hour in angling in the Don, Aberdeenshire. Walking along through the grass of a field near the river, I was suddenly startled by a loud squeaking noise at my feet. Looking down I saw that the noise came from a Weasel, which had seized the boy's trousers a little above the ankle, and was hanging on like 'grim death.' I told him to strike it with the butt-end of the rod, which he happened to be carrying, and he at once did so, rendering the Weasel insensible. I then seized the boy's cap, and putting it over the animal, secured it, took it home, and killed it. Have any of your readers ever been attacked in a similar fashion? I have heard that Weasels are sometimes very ferocious if they have any young ones about, but this was my first experience of any such ferocity. I afterwards examined closely the locality, but could find no trace of a nest or of any other Weasel."—JOHN CUMMING, Crouch End, N.

On p. 328 of No. 4, F. N. Q., Mr Bernard Saunders refers to "dead Field-mice being found on footpaths more frequently than anywhere else." I suggest that he means Shrews, commonly called Shrew-mice by country-folk, though, as we all know, they are not Mice at all, but belong to the Insectivora. In some parts of Shropshire the Common Shrew goes by the singular local name of Hardy-straw. On p. 282 of the same issue Mr Bevir quotes Hudson as stating that the Crow associates with Rooks and Jackdaws. That the Crow is gregarious in districts where it is numerous I am fully aware from observation in the west of Wales. Here it is gregarious to such an extent that one may see 40 or 50 together on the mountains, and 100 or more will roost together in a wood, but I never knew them to associate with any other species of the family. I can hardly help thinking there is some mistake as to their mixing with Rooks. I entirely agree with your editorial as to the lack of knowledge of general scientific principles among members of field clubs. I never knew any one attempt to give the members of a club any idea of the general principles of zoological or botanical relationships. Too many clubs spend their time in splitting one species into a hundred, or going miles to uproot a rare plant in its 'only British locality.' We should study plants and animals alive, and see how they work out their life-histories, acting and reacting on one another. This is the true interest of Biology, and the means of study lie at our very doors."—H. E. FORREST, Shrewsbury.

Dead Field-Mice on Footpaths.—"In the last F. N. Q. a correspondent wonders why dead Field-mice are found so commonly on the footpaths across fields. I would suggest that this extraordinary fact is due to precisely the same reason that anything else lying motionless in a field is more likely to be found if it happens to be on the footpath. I confess that it seems to me just as pertinent to inquire why more half-crowns are found on a footpath than in the grass ; the answer to the riddle being that they are there more in the line of vision."—"OBVIOUS."

Pheasant reproducing a lost Beak.—"The enclosed head of a hen Pheasant is from a bird shot at Ewyas Harold, Herefordshire. The beak has evidently been cut off in some manner, probably by a trap. It is apparently in process of being re-constituted. Naturally the bird was very thin, as it must have had great difficulty in feeding, but it flew fairly well. The contents of the craw were berries. I send the specimen as an instance of the extraordinary vitality of some animals and their organs."—W. STEWARD, Pontrillas, Hereford.

(A most interesting specimen. The puzzle is how the bird could have managed to eat for a time. Probably she did not, but went very near to perishing of starvation ; but the great recuperative power of the tissues produced a stumpy, rounded, beak-like projection—more like horny lips than anything else—just in time to enable feeding to be resumed and life prolonged. The beak was cut off or shot off, leaving the original base, from which the new growth started.—ED. *F. N. Q.*)

Parasite on Birch-Tree.—"The enclosed photo was taken on the wooded slopes of Wharncliffe Chase, near Sheffield. My eye was attracted by a white blotch on the dead stump of a birch-tree, and on approaching closer I found the object to be a large fungus growth, evidently fresh. It is plainly visible in the lower part of the photograph. Its surface was perfectly smooth, and it was of a light creamish colour. Higher up on the stump, also seen in the photo, was a similar growth of older date, the top skin or outer skin peeled into little blackened shreds, giving the growth a remarkable resemblance to the birch-bark itself. At a short distance this old growth looked like a mere excrescence of the wood. I should like to learn whether the fungus is peculiar to birch."—A. E. JOHNSON, London.

Mr Carleton Rea writes concerning this photo, which is reproduced at p. 52 of this issue: "The photograph represents a birch-tree with several pilei of the parasitic *Polyporus betulinus*, Fr. This species is confined to birch, and is only too common in our woods. It is a wound parasite, and ultimately causes the death of the tree. It entirely destroys the wood, where it penetrates lignified cell walls, sieve tubes, bast rind, and even the stone cells. The flesh of this parasite is sometimes cut up into strips and utilised as razor-strops, and micro-lepidopterists often use it in place of cork for pinning on their fragile silver pins."

Answers to Correspondents.

J. G., Southport.

The shore outline is changing rapidly in various places, in some being added to, in others being washed away. The promontory of Dungeness, Kent, has grown for two hundred years at the rate of 36 feet a-year. The sandstone island of Heligoland is a mere fraction of its former size; probably only a quarter is left. At Bideford Bay, where Westward Ho stands, the sea has removed the land recently at the rate of 30 feet a-year. See Prof. Cole's 'Open-Air Studies' for many similar examples.

H. M., Bath.

The Potato disease is due to a fungus producing whitish spots on the under-sides of the leaves. Threads penetrate in all directions through the tissues of leaves and stalks, feeding on the cell material and attacking the tubers. See 'Nature Studies' (Scott Elliot).

CODLIN, Worcester.

The Codlin Moth, a small grey insect, lays the egg in the centre of the withering flower; the caterpillar developing from this eats down to the core, destroying the seeds, and emerging through the flesh of the apple. It then hides in the bark during the chrysalis stage, coming out the next spring as a full-grown Codlin Moth.

AGNES, Chichester.

The peel of the fruit contains oily matter which serves as a protection for the soluble substances in the flesh, notably the sugar.

A. F. G., Grimsby.

The Soldier Crab dwells in a whelk-shell, discarding a small one for a larger as required.

A. K., Huddersfield.

The Right Whale or Greenland Whale is one of the large whales without teeth. Their food consists of minute marine animals, which are separated from the water by a process of straining through the plates of whalebone. These whalebone plates project down from the palate. The Dugong and the Manatee comprise the order of Sea-Cows (Sirenia), and gave rise to the idea of the mermaid.

J. R. V., Lampeter.

The Apteryx or Kiwi is the small wingless bird of New Zealand, about the size of a large fowl. The Moa was enormous, about 12 feet in height. It is now extinct, but its remains are found sometimes in abundance. We shall refer to this bird later.

GAME-BIRD, Sussex.

The Pheasant is a native of Asia Minor and South-East Europe. The Turkey hails from America.

E. G., Manchester.

Animals of the Rhinoceros type, though now confined to Africa and South Asia, were ages ago widely distributed. Some of these extinct forms inhabited Britain. A single horn upon the nose.

SUBSCRIBER, Hants.

You will find a description of the gradual evolution of the horse's leg in any up-to-date text-book on Zoology. The five-toed ancestor was Phenacodus. Equus walks on its middle digit. The Ostrich (African) has two toes, the third and fourth. The males incubate the eggs.

R. M., Leeds.

Yes, warm blood is evidently to be associated with a high intelligence and great activity. Compare birds and mammals with reptiles.

Young Naturalist's Quarterly Competition.

IN order to encourage the study of natural history and other scientific subjects, the Editor offers prizes every quarter for the best essays sent to him on the prescribed subjects. The competitions are open to all young students and scholars, and are specially intended for the pupils of public schools, colleges, &c., which have natural history and other societies for their scholars. Competitors must send their essays in their own handwriting, together with a statement from their head-master or clergyman certifying the essay to be the original and unaided work of a competitor under nineteen years of age. Essays should not exceed 1000 words, but may be as short as desired. In awarding the prizes, the Editor, whose decision is final, will take into account both the accuracy of the matter and its arrangement. The result of the competitions will be announced in the following quarter's issue. The successful competitor must then select his or her prize from those offered, and inform the Editor at once where the prize is to be sent to.

The Editor reserves the right to publish any of the essays sent in.

Note.—The subject for the next quarterly competition is, **"The Function of Flowers in the Plant World."**

Competing essays (with statement of age and originality) must reach the Editor of the 'Field Naturalist's Quarterly,' 17 Hartington Place, Edinburgh, on or before April 25, 1903. Envelopes to be marked "Competition Essay." The prizes will be announced in the next issue of this journal. First prize, any two of the following books; second prize, any one of them:—

School of the Woods (Long).
Beasts of the Field (Long).
Fowls of the Air (Long).
British Vertebrates (Aflalo).
A Year with Nature (Westell).
Fauna of Shropshire (Forrest).
British Serpents (Leighton).
The Vivarium (Bateman).
Open-Air Studies, Geology (Cole).
Nature Studies, Botany (Scott Elliot).
Norfolk Broads and Rivers (Davies).
Photography for Naturalists (English).
Field Naturalist's Handbook (Wood).
&c., &c., &c.

The Prize for the best Essay on "How British Amphibians and Reptiles pass the Winter" has been awarded to Margaret Groser, 47 Onslow Gardens, London, to whom the prize will be sent on receipt of titles of selected books.

Notices.

TO CONTRIBUTORS AND CORRESPONDENTS.

ALL articles and other communications (typewritten if possible) intended for publication, and all books, Transactions, papers, &c., for review or other notice, should be sent to the Editor, 'Field Naturalist's Quarterly,' 17 Hartington Place, Edinburgh.

Business communications should be addressed to the Manager at 45 George Street, Edinburgh.

Contributors are requested to write the department to which their communication refers (*e.g.*, Ornithology) on the envelope.

Every effort will be made to return unused communications where stamped addressed envelopes are enclosed for that purpose, but contributors are advised to keep copies of their MSS., as the Editor cannot undertake responsibility for their non-return. Photographs or other illustrations sent for publication must be original and the absolute property of the sender.

The full name and address of the sender must accompany every communication. Anonymous communications will not be noticed. Correspondence is invited on all matters of general interest which fall within the scope of work usually done by field clubs and kindred societies. Original observations on the habits of living animals and plants will be specially welcomed.

The 'Field Naturalist's Quarterly' will be issued in February, May, August, and November; and all communications for the ensuing issue should reach the Editor at least one month in advance.

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The annual subscription to the 'Field Naturalist's Quarterly' is 10s. post free. Single issues 2s. 6d. each. Subscriptions, which may begin with any issue, should be sent to the Manager, 'Field Naturalist's Quarterly,' 45 George Street, Edinburgh.

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Copies of Nos. 1, 2, 3, and 4 of the 'Field Naturalist's Quarterly' can still be obtained by new subscribers who wish to have the volume complete.

Cases, in green art linen, for binding volume i. of the 'Field Naturalist's Quarterly,' may be obtained from the publishers, price 6d. (post free 7d.) The publishers are also prepared to bind volume i. in the above style at 9d. per copy (including postage 1s.)

To Advertisers.

Applications for terms and spaces to be sent to the Manager, 'Field Naturalist's Quarterly,' 45 George Street, Edinburgh.

Special terms for selected places, or a series of (changeable) advertisements.

The Editor begs to acknowledge the receipt of the following books, periodicals, &c. :—

A Book of Beasts and Birds.[1] By Gambier Bolton. George Newnes & Co. Price 5s.

The Natural History of Selborne. By Gilbert White. Notes by R. Kearton. Illustrations by C. and R. Kearton. London : Cassell & Co. Price 6s.

The Field Naturalist's Handbook. By Rev. J. G. and Theodore Wood. London : Cassell & Co. Price 2s. 6d.

Eyes and no Eyes. By Arabella B. Buckley. London : Cassell & Co. Price 3s. 6d.

A First Book of Forestry. By F. Roth. London : Ginn & Co. Price 3s. 6d.

School of the Woods. By William J. Long. London : Ginn & Co. Price 7s. 6d.

Earth and Sky. Part I. By J. H. Stickney. London : Ginn & Co. Price 1s. 6d.

Natural History of Animals. Vol. I. By Prof. Ainsworth Davis. London : The Gresham Publishing Co. Price 7s. per volume.

Nature Studies. By G. F. Scott Elliot. London : Blackie & Son. Price 3s. 6d.

Observations on Popular Antiquities. By J. Brand. London : Chatto & Windus. Price 3s. 6d.

The Natural History and Antiquities of Selborne. By Gilbert White. Edited by L. C. Miall and W. Warde Fowler. London : Methuen. Price 6s.

The English Lakes. By F. G. Brabant. London : Methuen. Price 4s.

Stories Mother Nature told her Children. By Jane Andrews. London : Ginn & Co. Price 2s. and 2s. 6d.

Agricultural Zoology. By J. Ritzema Bos. Translated by Prof. A. Davis. London : Methuen. Price 3s. 6d.

Who's Who at the Zoo. By Beatrice Thompson. London : Gay & Bird. Price 5s.

'Knowledge' Diary and Scientific Handbook, 1903. London : 'Knowledge' Office. Price 3s.

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[1] To be reviewed in our next.

The Boyhood of a Naturalist. By Fred. Smith. London and Glasgow: Blackie & Son. Price 3s. 6d.

Open-Air Studies. (Geology.) By Prof. G. Cole. London: Griffin & Co. Price 8s. 6d.

The Natural History of Plants.[1] Part I. By Kerner and Oliver. London and Glasgow: Blackie and Son. Price 1s. 6d. net per part (16 monthly parts).

Annual Report of the Southport Society of Natural Science.
Annual Report of the Caradoc and Severn Valley Field Club.
Annual Report of the Natural History Society of Glasgow.
The Naturalists' Journal—November and December.
Nature Study—January.
Knowledge—November, December, January.
The Naturalist—November, December, January.
The Avicultural Magazine—November, December, January.
The Gentleman's Magazine—December.
Yorkshire Weekly Post (four numbers).
The Animal's Friend—January.

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[1] To be reviewed in our next.

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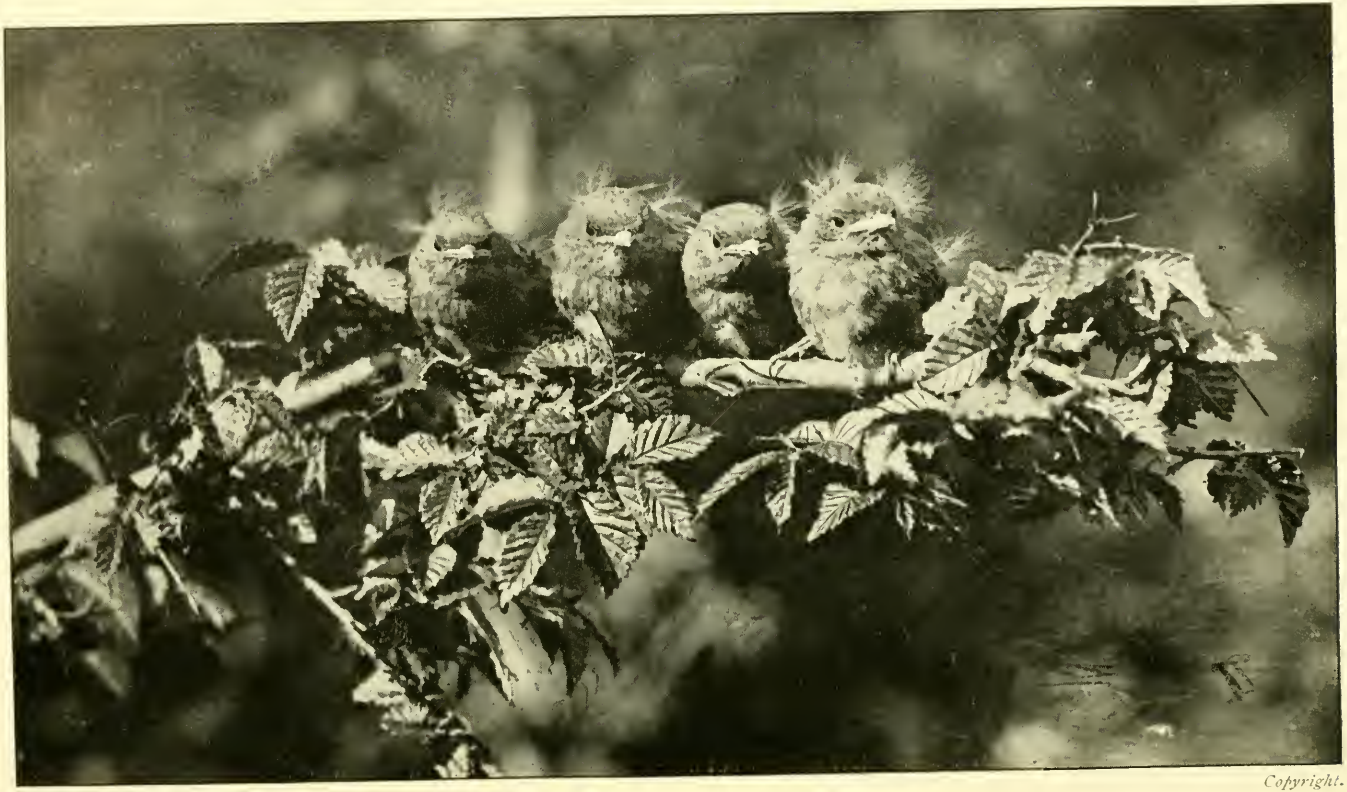

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YOUNG ROBINS.

The Field Naturalist's Quarterly

Vol. II. MAY 1903. No. 6.

Editorials.

The great annual miracle—as Longfellow terms the advent of spring—is upon us once more, with its ever-recurring promise of life and continuity. He must be a dullard, indeed, to whom the general reawakening of plant and animal, herb and insect, bird and butterfly, does not suggest thoughts of wonder, gratitude, and hope. It is, indeed, a commonplace that every section of the community rejoices in the mere fact that spring has come, even if they be so situated that their daily life is not in any marked measure affected thereby. Few are so indifferent to their surroundings as not to feel some sense of reinvigoration when they find all things giving evidence of new life; but of all people it is the true nature lover, the observant and cultured field naturalist, to whom the season means most. Whatever be his special hobby, now is the time for renewing his observations and comparing them with those of former years, and with those of his fellow-workers. Not many years ago those workers were comparatively few in number, and outside the ranks of the workers there were fewer still who were interested in the results. At the present moment the outdoor observer may rest assured that there is a large and ever-increasing audience in this country anxious to be told of what he has seen, and to listen to any thoughtful remarks he may have to make thereon. And if any one wishes for proof of the statement that there is a great movement going forward in the direction of the love of knowledge in the natural sciences, we would select three lines of evidence in support of the contention.

First of all, take the Press. Not many years ago it was exceptional to encounter articles on outdoor nature observations in the ordinary papers. Gradually during the last few years such articles have been increasing in number and frequency, not only in what may be termed more serious publications, but in the ordinary weekly and even in the daily papers. At the present moment it is almost the rule for a large daily paper to have a weekly column devoted to the consideration of animals or plants or both. This supply must be in response to a demand which those responsible for the management of the journal perceive; and even though some of the matter thus published be not of a very high standard,—most of it is extremely good, however,—its publication is a sign of the times, and can be only a factor for good in our population. Of more serious literature it is sufficient to say that the number of volumes dealing with plants and animals which are issued every month is nothing less than astonishing. We sincerely hope that all the good ones meet with a ready sale. If publishers as well as editors are good judges of the demand in books (and they ought to be), this too is a striking sign of the times.

Secondly, we would instance the great change which has come over the minds of those who are responsible for the education of the young, not omitting the Education Department. Nowadays it is expected that a nursery governess shall take care to implant in the young intellect a love for animals and flowers,—a love which we are just finding out was there already, and only wanted guiding and educating. Take up at random half a dozen books for children, and we find that the fairies and goblins and fantastic imaginations of our own childhood have given place to well-written and generally *accurately* illustrated books on animals and flowers. It makes one wonder if children did really enjoy the weird intellectual dishes that were formerly served up for them. It cannot be doubted that the present courses are far more wholesome. The State, too, following the lead of the parent, has at last realised that Nature Study must be made a reality.

Thirdly, we would point to the great increase in the membership of Field Clubs and Societies, and the multiplication of such institutions all over the country. We have been much impressed in reading the annual reports of these bodies for the last two years with the uniformity with which one phrase recurs. In every report one finds a sentence which runs, "The number of new members elected during the year was *x*, being an increase of *x* over the preceding year," or some like words. Everywhere the membership of these clubs is advancing, and with that there must be some degree of corresponding interest and love for natural science.

Such being the case, it behoves those who have the management of Field Clubs to see that their new recruits are not disappointed in their hope of gaining much good and sound knowledge at the hands of their fellow-members. Our Field Clubs are becoming a quiet power in the land, and it is our sincere hope that that power will grow and multiply, for we are convinced that it is an influence which is wholly for good.

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Our readers will remember that in our last issue we published an article by W. Long entitled "How the Animals Die." We felt sure that it would prove of great interest to all nature lovers, and for that reason obtained permission from Messrs Ginn & Co. to reproduce it, stating at the time that it formed the concluding chapter of Mr Long's book, 'School of the Woods.' Our expectations were more than realised, and it would probably not be too much to say that few articles have recently been published in natural history periodicals which have attracted so much attention. The number of papers which quoted it was remarkable, and not a few devoted leading articles to its argument. We only regret that whilst our contemporaries acknowledged it as taken from the F. N. Q., many of them did not add that its original source was from Mr Long's book. We draw attention to this in order that our readers may know where to find a great deal more from the same gifted pen, for we are certain that 'School of the Woods' will be read with intense delight. The reception accorded to this article is another proof of the growing interest in the subject.

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Our illustrations in this number reflect various branches of field-naturalist activity. We are indebted to Rev. F. Barnwell for those of the Chartley cattle, taken specially to illustrate Mr Masefield's article. Mr Tait sends us the views of the puffins, taken at Clo Head, Sutherland, and raises a query as to their attitude which we hope our correspondents will enlarge upon. Mr Douglas English is responsible for the excellent pictures of British newts, a group of animals which we rarely see photographed from life. Our frontispiece is again by Mr Dewhurst, whose illustrations of bird life are so successful. Mr Johnson again illustrates his own article, and is assisted by Mr Gatty's photos of flint instruments; whilst once more a contributor from far-off China sends his quaint sketches.

The Language of Birds.

By E. Kay Robinson.

I WRITE to solicit the help of readers in compiling a dictionary of the language of birds. In tracing the relationship of human races, language is known to offer the most reliable chain of connecting-links between widely sundered tribes; but we almost totally neglect the equal value in this respect of the language of birds. By a man's dialect you can guess his county, sometimes even his town; by his actual "language" you can tell his nation; by the roots of its words you can fix his nation's place in the human family; but from a bird's language we learn nothing whatever.

This is the more surprising because the language of birds is so easily analysed. It has no accidence or syntax, no conflicting alphabets or confusion of accents. Its consonants are very few, and the entire vocabulary of most species scarcely contains a dozen words. But we do not realise what birds' language is, because we pay so much attention to their song, whereas this is the least important of the many phases of bird language from a scientific point of view. We might as well be content in ethnology with stating that "the language of the English is 'Brit-annia-rules-the-waves'; whereas the French language has a catchy rhythm in which the word 'marchons' is frequently repeated."

The song of birds is not their language—it is their challenge. As such it has its value, but, being a comparatively recent acquisition, it could only serve as a means of classification between species, which are easily classified by other features. Birds use other and more ancient notes, however, some of which carry us back almost to the beginning of birddom.

The oldest part of bird-language is probably the cry of the nestling, not only because the circumstances in which it is uttered have undergone least change, but also because the most ancient traits of all animals are to be found in the very young. Thus, if we suppose that the first great division of birds took place between those that "chirped," like the young sparrow, and those that "cheeped," like the young chicken, we have practically divided all existing birds into two natural classes. The pigeon, for instance, might, from its habits, size, shape, &c., be regarded as a perching bird; but the cheeping of its young classes it at once, and correctly, with the swan and the plover rather than the sparrow and the thrush. There are exceptional groups whose young have peculiar voices; but these, as I will show later, have been modified by circumstances.

Next in point of age and authority for purposes of classification would come the call notes. These, like the familiar household words of human language, would naturally have changed little, as being in constant use between immense numbers of individuals. And here we see at once how large chunks of the bird-kingdom can be correctly classified. Indeed, if you look down Professor Huxley's scheme of classification, which will probably form the basis of the system of the future, you will see that the birds might have been arranged in much the same order by their call-notes alone, although Huxley's scheme is founded upon minute and puzzling details of anatomy, with many exceptions to its own rules.

But the strongest proof of the value of the voices of birds as a guide to classification is to be found in the fact that such birds as the cuckoo, swift, nightjar, woodpecker, and wren among British passerines are almost the only ones which we could not confidently put in their places by their voices alone, and that these are the very same birds which present a puzzle to the scientific anatomists. The cause of the difficulty is the same in both cases—namely, that connecting links appear to be missing; and I believe that we are just as likely to discover these by study of their language as by study of their bones.

The foregoing paragraphs are to some extent quoted from articles which I have previously written elsewhere in order to illustrate the importance of a careful analysis of the language of birds; and I shall now explain the plan which I hope that some readers will assist me to carry out.

I propose to divide the language of birds as follows. Taking the notes of the young first, we have (1) the call for food. This appears to be habitually used only by youngsters which can run, like chickens, or swim, like ducklings, or whose safety is otherwise secured by nests in inaccessible positions, as house-martins, or in holes, as barn-owls and starlings. Young birds in open nests are generally as silent as the dead. Thus at the very threshold of investigation we reach a very interesting point. Next (2) there is the young bird's note of anxiety. This seems to be uttered by the young of all birds when they have been separated long from their parents. In such cases in a state of nature they would infallibly die unless their parents discovered them, and therefore they raise a clamour. It may attract enemies, but it is their only chance of escaping death. The note of fear (3) is only used apparently by those young birds whose parents are strong and courageous. A farmyard hen will assault and drive off a dog which has frightened her chicks and made them call out. The note of distress (4) is common to the foregoing class, and also to gregarious birds, such as sparrows and starlings, because these birds will often assemble to beat off an enemy when they hear a companion in distress. It would be interesting to know whether there is any difference in this respect between the young rook and the young carrion crow. The note of menace (5) seems peculiar to those nestlings which are reared in holes, like barn-owls and starlings, and is no doubt useful sometimes in scaring away intruders; and it can do no harm, because the young have no other means of escape. Young birds in open nests, from which they can scramble as a last resource, are silent when danger threatens, and thus often escape unnoticed. Lastly, so far as the young are concerned, there is (6) the note of content, which is uttered by chickens when they nestle under their mother, and is presumably characteristic, like the note of fear, of the young of parents who can fight to protect them. Otherwise it would be better for the young to keep quiet, no matter how happy they may feel.

Passing now to the notes of adult birds, we have first those sounds which are uttered by parents to their young. They are three in number. There is the special call to the young (7), which appears only to be used, as indeed one might expect, by those birds whose young can run or swim immediately after they are hatched. We are familiar with this note of the hen and the swan, the redshank and the partridge. Then there is the note of warning to the young (8), which is best observed in the case of the song-thrush. So long as the parent repeats this note, the young thrush which has just left the nest will hardly stir, even when your hand is raised to seize it. The third note used by parents to their young is one of domestic content (9), typified by the crooning note of a hen brooding her chickens. You may hear a partridge use it too; and it seems characteristic of those parents which can fight in defence of their young. Prudence keeps others silent.

Next we have an interesting group of four notes used by adult birds to their mates. The note of courtship (10) is best illustrated by the elaborate cooing of the domestic pigeon as he bows and sweeps the ground all round the object of his affections. Song-birds, on the other hand, use very simple little notes in courtship. The call to the mate (11) is also best exemplified by the pigeon, who, when uxoriously inclined, enters the nest-box and there utters booming sounds which can be heard by his wife at a great distance. The note of love (12) you may hear uttered by the half-hour together by a pair of starlings which have retired into their nesting-hole. The twittering house-martins offer conspicuous examples too, as do house-sparrows. Is this note peculiar to birds which build nests in inaccessible places? The last of the notes which birds address to their mates is that of warning (13). Perhaps the best example of this would be the monotonous "cheee" of the greenfinch, if one could only be sure that it is intended as a warning to the sitting mate, and not a futile note of menace to the intruder. There is no doubt, however, about the warning notes of the wagtail, who signals your movements to his listening wife.

The following five notes may be classified as the expressions of personal emotions. The note of domestic anxiety (14) is well illustrated in the plaintive "tee-wee" of the greenfinch, because this same bird uses a different note—the long-drawn "cheee" already referred to—in warning his wife of danger. The note of menace (15) is commonly used by tits, owls, and other birds which build in holes — for the same reason doubtless that young owls hiss and clack their bills. The note of fear (16), on the other hand, is most characteristic of ground-birds, like the partridge, and water-birds, like the duck. These, when suddenly attacked, often escape by making a prodigious clatter. The blackbird offers a curious problem in this respect, because he is very noisy when frightened ever so little. He is conspicuous also for the noise which he makes when he is going to bed, and when vermin is on the prowl. The explanation seems to be that the blackbird was until very recently—as evolutionists calculate time—a gregarious bird like the fieldfare, whom he closely resembles in many particulars of conduct; but that, having definitely adopted cultivated regions as his permanent home, he has been obliged to abandon his gregarious habits—how would it be possible for him to nest, like the fieldfare in the far north, in "colonies" in English fields patrolled by birds-nesting yokels?—but has not yet changed his manners.

More acute and shrill than the note of fear is the note of distress (17) which every one must know well who has picked up a wounded sparrow or starling. They are noisy, no doubt, by gregarious instinct, raising an outcry with the, perhaps unconscious, hope that comrades may come to their assistance. The lamentable squawking of a captured fowl might be regarded as a cry for help, too; but other birds utter sounds of distress which cannot thus be explained. The pigeon, for instance, grunts when it is seized, and there can be no idea of summoning other pigeons to its help thereby. Still I think that when the language of the birds begins to be a little understood, the squawking of a distressed fowl or the screeching of a wounded starling might be placed in different categories from the grunting of a troubled pigeon.

Proceeding, however, with our series, we conclude the notes of personal emotion by the expression of self-assertion (18). This is generally limited to the males, and includes the song of singing-birds, the crowing of game-birds, and the strange, raucous sounds of many waders and water-birds. In each case a challenge is uttered to every male of the same species within hearing, and it means that the challenger has taken possession of a nesting-site with a sphere of influence attached, which he is prepared to defend against all rivals of his own kind. This is why closely related species—as, for instance, the willow-wren and the chiffchaff—may have totally different songs. They are addressed solely to males of the same species; and the more distinct they are from all other challenges the better they serve their purpose. The chiffchaff has no fear that any willow-wren will come and steal his wife; but let any other male chiffchaff dare to come, and the shrubbery is full of alarums and excursions until the feud has been decisively settled.

Only three heads of bird-language remain. These are employed solely by gregarious birds. The note of conversation

(19) may be exemplified by the twitter of finches, and the needle cries of tits, which serve to keep the wandering flocks together and to express all the ordinary emotions of comradeship. Study of birds' language may possibly expand these conversational notes into the largest part of the whole subject: the great tit, for example, uses so many different expressions that an article might be devoted to them alone. The sociable cawing of the rooks and mewing of the gulls fall under this head also; and each would fill a chapter of the Dictionary of the language of birds. Next there are the call notes (20)—the whistle of golden plover, the weird cry of the curlew, the honk of the wild geese, and scores of other distinct sounds; and lastly, the notes of warning (21),—the plaintive "pee-ee" of the peewit, the "chak, chak, chak" of the fieldfare, and the whimper of the redshank may serve as instances.

Thus it will be seen that although, for the sake of brevity, I have sometimes lumped slightly variant classes of notes under one head, there are twenty-one distinct sections of the vocabulary of birds. It is impossible for one observer to cover so large a field, and I have written this article in the hope that some readers will send me notes on the subject. From these and my own observations I hope to be able to show some advance, when I next write on the subject, towards a proper understanding of the language of birds.

Below is appended a table, showing the order in which notes should be arranged, with an instance of each for example.

Notes of Young.

1. For food.	Hissing note of young starlings.
2. Anxiety.	Loud chirp of young sparrows separated from parents.
3. Fear.	Loud "cheep" of chickens when alarmed by dog.
4. Distress.	"Screech" of young starling when handled.
5. Menace.	Young barn-owl clacks its bill.
6. Content.	Gentle cheeping of chickens under their mother.

Notes of Parents.

7. Call to young.	Pleasant barking note of swan.
8. Warning.	"Chuck" of thrush.
9. Content.	Crooning note of hen over chickens.

Mating Notes.

10. Courtship.	Elaborate cooing of male pigeon.
11. Call to mate.	Booming noise of male pigeon in nest.
12. Love.	Musical hissing note of starlings.
13. Warning.	"Cheee" of greenfinch.

Personal Emotions.

14. Domestic anxiety.	"Tee-wee" of greenfinch.
15. Menace.	Hissing of wryneck.
16. Fear.	Clatter of frightened partridge.
17. Distress.	Screech of wounded sparrow in the hand.
18. Self-assertion.	Song of nightingale.

Gregarious Notes.

19. Conversation.	Twitter of linnets.
20. Call notes.	Whistle of golden plover.
21. Warning.	"Chak-chak" of fieldfare.

Under each head a description or imitation in words of any note that may be heard should be placed, and I am sure that the frequent use of a notebook for this purpose would add considerably to the interest of country rambles.[1]

The Spring Awakening of the Sea.

By F. G. Aflalo, F.R.G.S., F.Z.S.

NATURALISTS are wont at this season of the year to frame sympathetic accounts of the quickening hedge, the renaissance of the woods, the coming of the swallow and cuckoo, the rearing of noisy broods—in short, the coming of spring. There is an equally recurrent vitality in the waters on our coasts, though, as returning bass and mackerel are less in evidence than returning nightingales and blackcaps, these vernal wanderings of fishes that had temporarily left our shores for more genial winter haunts escape the notice of most people.

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[1] Readers will oblige by sending replies to the following address: Warham, Wells-next-Sea; or c/o Editor, F. N. Q.

The fishermen, however, know that the shallow waters within two or three miles of our coast become, during the second quarter of the year, not perhaps more thickly populated than they were in winter—for the cod and whiting, then so plentiful within hail of the piers and beaches, are gone to sea—but certainly occupied by other inhabitants. The little brown sand-eels and their greener kinsmen, the launce, which were buried all winter in the sandbanks of our south-coast estuaries, once more teem in the warming waters, the veterans and a younger generation together. The smaller bass are on the move. Already in March they were caught at dockheads west of Portland; in April they find their way farther east, while down in the west country larger bass come along in their turn.

There is not, perhaps, the same seasonal regularity with the fishes that migrate under the seas as with the birds that migrate over them. The punctuality with which the ornithologist is able to record the coming of the majority of migrants in April, with a few forerunners in March and as many stragglers in May, would be impossible to him who watches for the coming and going of the fishes. It might be thought—and it may be true—that conditions of weather and temperature would be likely to vary from year to year with a further-reaching influence on the journeyings in the air than on those dark and secret movements beneath the waters. It may be that the wandering fishes are inherently more irregular in their arrangements. It may even be that the yearly variations in the conditions affecting their itinerary, the supply of food, the presence of formidable enemies, or the strength of adverse or propitious tides and currents, are more marked than we have hitherto had reason to suppose. Whatever the cause, the fact remains that the fishes of our seas neither come nor go with quite the mechanical precision noted in the case of so many of our bird visitors.

At the same time, there is some approach to uniformity of movement year after year. The opening and closing days of our salmon-rivers have, no doubt, been fixed with a proper regard for the programme of that particular fish in each district. If there were not, at any rate, a semblance of punctuality in the movements of the shoals, our offshore herring and mackerel fleets would be hard put to it to know when to fit out each season. As it is, the new-barked fleets of nets are put on board the smacks and luggers at much the same time every spring, and the boats fare forth on the high seas with some reasonable hope of encountering the advancing shoals much where and when they were encountered the year before.

The objects of migration are as obscure among fishes as they are among birds. It requires no very powerful imagination to appreciate the reasons which prompt our winter visitors, the ducks and geese, to fly south of their frozen-out feeding-grounds in the arctic circle, and spend the rest of the winter on the more promising feeding-grounds off our own coasts. The causes of the visits of our summer-visiting birds, of the cuckoo and the nightingale, are, and must for the present remain, a mystery. Whether our islands fulfil their ideal of a summer residence, and, if so, why?—these are questions which no one has successfully answered. There is no question of food, because both insect and vegetable food is usually more abundant in summer in their native winter lands than with us. That the temperate British climate may be more suitable for the rearing of healthy families is quite conceivable, but the reasons for such a recommendation are far from obvious. These reasons for migration, already so obscure in connection with winged travellers, become altogether unfathomable in their application to fishes. So unnecessary, on the face of it, does this spring inshoring seem to that class of animals, many of which even spawn in the colder months and not in April and May at all, that we may well forgive the unscientific but pious naturalists of other centuries, who took the anthropocentric view of these blessings and vowed reverently that Providence, which always had a special eye for the benefits of the British realm, ordained of set purpose these inshorings to provide abundance of food. It might occur to some that this view is a little weakened by the absence of a counsel of perfection in these arrangements, for it is an undeniable fact that, by the existing scheme of migrations in the sea, those species—like mackerel and red mullet—which decay most rapidly in hot weather, are most in evidence on our shores during the summer months; whilst those—like the flaky cod—which would keep better under a trying condition of temperature, are present on our coasts in winter only. It is therefore necessary that the student of first causes should seek some explanation of the coming of fish to our shores other than the resulting benefit to the blest subjects of King Edward.

Temperature is probably the indirect, and the consequent increase of food the direct, cause of this phenomenon in the fish world. The waters of only a few fathoms deep, within, say, the three-mile zone, do not get warmed up to a certain degree of temperature until some time in April or May or even June, according to the seasonal conditions of each individual year. When that temperature is reached, the waters become the scene of reawakening life, and the creatures of infinitesimal size —the larval or adult crustaceans, molluscs, or medusæ, which are the components of "plankton"—once more thicken the bays and estuaries with their nutritious abundance, and attract the shoals of hungry fish from the deeper water. It may be also that the increasing temperature makes their enemies, the sharks and others, more active in pursuit of their prey, and from these, too, the inshoring shoals find respite in the shallows.

In conclusion, it must be insisted that any comparison of the migratory instinct in the two realms, the air and the water, especially as regards punctuality year after year, should always take account of the distinction indicated at the beginning of this article — the greater obscurity of life in the seas, and, more particularly, the slighter attention that has been paid to the study of the life-history of fishes. For every student of fishes, particularly in the natural state, there are a thousand students of birds. Every country ramble reveals to the watchful observer some new trait of bird life, whereas to a merely nodding acquaintance with the habits of sea-fish, even more than of those which dwell in rivers or ponds, go years and years of inquiry and patient study. Thus it is that in this matter of migration, arrival and departure alike, the movements of the more familiar bird visitors are as minutely chronicled in the scientific and popular press as those of distinguished foreigners paying visits of state. Nay, since the interest in travelled birds is so general, imagination is sometimes allowed to come to the aid of ocular evidence, and the cuckoo and nightingale are gravely recorded as arriving a month or so—some of these eyewitnesses are not fastidious to a week—before their time. The arrival of the fish is accepted only on the strength of catches in the nets or on the hook. We do not at the coast say, "We saw a school of mackerel this morning and a school of bass this afternoon." We reckon the mackerel and bass with us when they are actually brought up in the trammels or drift-nets or on the lines. Seeing is believing. Little idle boys, with a taste for practical joking, have before now duped serious newspaper correspondents with their skilful imitation of the cuckoo's plaintive note. No such imposition avails with the silent fishes. He who would convince us that the bass is back before its appointed time must show a living bass in proof of his assertion. Even a fresh one, with life extinct, would not be accepted by the scientific inquirer as conclusive evidence of the return of the species to any particular part of the coast. Fishmongers are many nowadays, and, thanks to railway communication and the rapid distribution of produce, Grimsby fish find their way into Hampshire markets before the noonday sun is overhead.

Reptile Studies.

By Gerald Leighton, M.D.

VII. Immunity.

In accordance with a desire expressed by some of my correspondents, I propose to deal in this issue with the subject of immunity from snake venom; but before doing so it is absolutely necessary that we should be quite clear as to what is meant by that term "immunity," and I shall therefore try and explain briefly and simply the general phenomenon so referred to. The exact nature of this phenomenon is one of the most fascinating and difficult problems in modern biology, and its solution is fraught with matters of the greatest importance to the welfare of mankind.

The first definite idea or conception of immunity was formed when physicians learnt that after recovery from certain diseases, and especially after smallpox, an enduring protection may be secured from a particular or specific disease. In some cases this protection is lifelong, in others more restricted. Jenner then pointed out that a similar result is obtained by undergoing a nearly related condition instead of the actual disease itself, as in vaccinia. In more recent years Pasteur's discoveries in artificial inoculations have given us a still clearer conception of what immunity really means. The question gradually shaped itself definitely into the query, Why is man not liable to certain diseases of animals? Why are animals never affected by some human diseases? Why do some races or individuals differ from others in their susceptibility to particular diseases? The answer to these questions involves the explanation of immunity. That answer cannot yet be given in full, but the putting of the question in that definite form enables us to define what we mean by the term; and so we may define immunity as that condition of an individual, an organ, or a tissue, in virtue of which infection can be resisted either absolutely or partially. For example, it is stated by some that the Mongoose can resist the poison of venomous serpents, and that it has this power because it is a Mongoose. In other words, it is asserted that this species of animal is immune to snake-bite; its tissues can resist the action of the venom in virtue of some property inherent in themselves, that property being what we understand by immunity. I am not concerned just now with the truth of the statement, I merely use it as an illustration. But if the Mongoose is thus immune to snake-bite, that is obviously a very different thing from the immunity that is conferred upon an individual as the result of having been attacked by a disease. Here some new element is concerned; the person who was before susceptible *has become* immune. So that we see at once immunity is of two kinds—Natural or Innate Immunity, and Acquired or Specific Immunity. One is the natural or innate power of resistance possessed by the tissues; the other is a specific acquired condition, the result of previous disease or of some kind of protective inoculation.

Every animal possesses some degree of natural immunity, otherwise life would be an impossibility. The degree, however, varies immensely, even in closely allied species, and sometimes in individuals of the same species. Thus European sheep are very susceptible to anthrax, while Algerian sheep are comparatively immune to this condition. Field-mice take tuberculosis and glanders readily, common mice and white mice not at all. It is the presence of facts such as these that makes the problem one of such complexity and difficulty, and there is much to be learnt before we can explain all that is involved. It would be quite beyond the province of this journal to discuss even what we do know about the causes of natural resistance; my object here is to make clear the distinction between that condition and acquired or specific immunity, which we know a great deal about, and concerning which an enormous amount of work is being done at present, the direct consequence of the brilliant practical results in the treatment of disease which have accrued from this line of investigation.

Acquired or specific immunity, then, is the result of recovery from disease, or of some kind of protective inoculation. Small-pox, scarlet fever, measles, and many conditions in animals, leave the individual safe from another attack for a longer or shorter period. Note particularly that each condition only protects against itself, not against another distinct condition. The great difference between this and the conferring of immunity by inoculation is that in the first case the patient has to undergo a period of reaction during which something is manufactured in the body which protects against the same poison in future, whilst in the case of inoculation that protective substance itself can be transferred ready made, and can therefore act at once. So that protective inoculation can be curative as well as protective, which is, of course, the whole importance of the process. This is what many have sought, and are seeking, in the case of snake-bite—to discover something which, on injection into the system, will at once confer immunity to the venom, without having to wait for that something to be elaborated in the tissues themselves. A substance having this power is called a specific anti-substance or antitoxin—that is, something which will antagonise in some way a poison or toxin. There are many methods of preparing these anti-substances which do not concern us here, the great practical point being that they are found in the serum of the blood of animals which have had the disease in question, and that this serum, on being injected into another susceptible animal, in many cases protects the latter from infection for a certain time, or antagonises the poison already in the system if it is injected during an attack of that special disease. The great distinction between the diseases in which this method of treatment is so successful and the case of snake-bite is, that the former are due to specific micro-organisms from which an antitoxin can be obtained, whilst snake-bite is due to a chemical poison secreted by the venom-gland. Still, in both cases, artificial immunity can be conferred in some instances, and it is undoubtedly only a matter of time for the discovery of more exact methods of application in order to achieve still greater success. If the venom of snakes were the same in all species the problem would soon be solved, but this is by no means the case, and as an antitoxin only antagonises a particular toxin, it is therefore necessary to obtain separate antitoxins for different venomous bites, or to discover some method by which the various antitoxins can be combined.

Having thus briefly explained what the idea of immunity involves, we may next consider the special case of the Mongoose.

VIII. Is the Mongoose immune to Snake-Bite?

The various species of Mongoose belong to the order Carnivora, family Viverridæ, sub-family Herpestinæ, there being over twenty species of the Mongoose or *Herpestes*.

These are mainly found in the Ethiopian and Oriental regions, one species, *Herpestes ichneumon*, occurring in Europe. The Egyptian species, known as Pharaoh's Mouse, is cat-like in so far as it destroys rats and mice, but is still better known as a fighter of serpents. Pliny and Aristotle were aware of this propensity, and ascribed the immunity of the Mongoose in these contests to the Mongoose first of all covering itself with a coating of mud, which rendered it impervious to the serpent's bite. Another African species, though a very rare one, *Bdeogale*, is known to kill, or at any rate eat, venomous snakes, Dr Peters having recorded the finding of a Rhinoceros Viper in the stomach of this Mongoose.[1] The Egyptian Ichneumon was venerated by the ancient Egyptians "probably on account of the services rendered by it in the destruction of snakes and the eggs of the Crocodile. All sorts of wonderful stories were once current about this animal's supposed habit of entering the Crocodile's mouth for the purpose of preying upon its vitals, and its imagined knowledge of herbs acting as antidotes to the bite of a poisonous serpent. A smaller species (*Herpestes griseus*) is undoubtedly of great use to the inhabitants of India, on account of its propensity for destroying snakes and rats. Here again natives believe that the animal is acquainted with antidotes to snake-bites."[2]

Quite recently the question has cropped up in the London press as the result of Dr Andrew Wilson's remarks in his column "Science of the Day." A voluminous correspondence ensued in the columns of the 'Daily Chronicle' as to whether the Mongoose was immune or not to cobra venom; and if so, whether it was due to the animal being naturally immune, or was able by partaking of some herb to confer upon itself an artificially acquired immunity. We know from what has been said previously that if immunity exists it is in one of these two ways: it is either due to the innate natural resistance of the tissues—a resistance which cannot readily be transmitted from one animal to another—or it is due to the inoculation or ingestion of some specific particular antidotal substance. In the case of snake-bite such antidotal substances have been supposed to exist from time immemorial by native tribes in various parts of the world, and many curious substances have been credited with possessing this antidotal power. Research in recent years has demonstrated that in two ways especially can this acquired immunity be conferred. One method, elaborated by Prof. Sir Thomas Fraser, is by the use of bile, the secretion of the liver. He showed in a series of experiments that within certain limits bile had the capacity of antagonising certain doses of snake-venom when injected as a mixture of both, or the bile separately. The other method is by injecting gradually increasing doses of venom into an animal until it contains in itself the specific anti-substance which renders it immune to ordinary fatal doses. This substance is contained in the blood-serum, and this when injected into another animal confers immunity upon the latter for a certain time. Dr Andrew Wilson was of opinion that the Mongoose, from long association with its snake enemies, may have developed a blood-immunity in this way, and that natural selection, acting in the direction of the survival of the fittest, had produced a species of mammal, the Mongoose, which was naturally immune. That is a perfectly scientific theory, and doubtless in some degree represents what has actually taken place in those animals which undoubtedly possess natural immunity to some diseases. Whether this has occurred in the case of the Mongoose is another matter, and the balance of evidence seems to prove that it is not so.

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[1] Amphibia and Reptiles, Gadow, p. 410.

[2] Natural History of Animals, J. Ainsworth Davis, vol. i. p. 90.

In the first place, it has been amply proved that the Mongoose often succumbs to the bite of the serpent, which, of course, would not happen were it naturally immune. The question then is, Why does the Mongoose not always succumb? To this there are only two possible answers. One is, that the Mongoose in his encounters with the cobra or other serpent *is not bitten at all;* in other words, that he bites first, and that so effectually that the snake is put out of action. The other possibility is that, having sustained what would otherwise be a fatal dose of venom, the Mongoose, in virtue of the special knowledge he has obtained from instinct or experience, is able to select an antidote for the venom, and thus save his life. Very detailed statements are made as to the nature of the antidote used. Thus, in the correspondence above mentioned, in the 'Daily Chronicle,' Mr H. Case writes on December 30, 1902: "There is no myth about it. There is no secret about it. Any Indian snake-charmer will supply you with a handful of this little plant, which bears a small round leaf about the size of a clover-leaf, and which grows abundantly amongst the grass in the rainy season. In the dry season the snake-charmers cultivate it by watering a patch of ground where it grows, as they always carry a good supply with them in the dry season, when they go to perform in front of the barrack-rooms all over India." Mr Case goes on to describe how these men take some Mongooses with them and set them to fight Cobras, putting down in sight of the Mongoose *some of the plant.* He continues: "Should the Mongoose get struck he leaves the snake and runs his fastest . . . to the heap of the plant, which he devours fast, until he has eaten sufficient for his purpose, when he runs back to renew his battle with the snake." Mr Case says that he has seen the Mongoose, in the rainy season, search and find the plant for himself. It is hard to bring oneself to regard such statements as the above as elaborate fiction, and for my own part I would not deny that the facts have occurred. But, nevertheless, the great majority of observers seem to agree now that the Mongoose is rarely bitten at all, but that by the exercise of his marvellous agility he dodges the strike of the Cobra, and fixes his jaws like lightning upon the neck of his adversary, or springs at the throat. It is quite as easy to believe that such special success in these encounters has been attained by natural selection through generations of the Mongoose, as to believe that the animal has gradually become immune; indeed it seems to be the correct explanation of the so-called "immunity."

One other consideration must be borne in mind. Possibly the minimum fatal dose for a Mongoose is considerably larger than that required to kill other mammals of equal size. We stated before that the most extraordinary variations are found in the susceptibility of animals to poisonous substances, and inasmuch as in very many cases of snake-bite the reptile does not strike with accuracy, and so wastes part of the venom, a very slight partial immunity would be sufficient to confer upon the Mongoose a good opportunity of emerging scatheless from what would otherwise be an encounter of the deadliest danger. Such a slight susceptibility, coupled with the undoubted dexterity the Mongoose possesses, would be quite sufficient to account for all the facts of the case, without the necessity of accrediting the animal with the ability to select and use his own antidote as occasion demanded.

The White Cattle of Chartley, Staffordshire.

By John R. B. Masefield, M.A.

On a high wind-swept plateau, almost in the centre of the county of Stafford, there exists an enclosed tract of forest or common land estimated to be 1000 acres in extent. The herbage of this area consists of the coarsest grasses, rushes, sedges, stunted heather and bilberry, and luxuriant bracken. Here and there are the remains of decaying or dead oak-trees, birches, and Scotch firs, in some places in clumps, and elsewhere probably the remnant of former woodland. Little rivulets are frequently met with, trickling along, draining the higher ground, and passing through the miniature valleys formed in course of years gone by. These streamlets, passing here and there over level ground, spread out and form ponds and marshes. Around this park is erected a stout fence of cleft oak posts and rails, some 8 feet in height. Such is the home and sanctuary of the surviving remnant of the so-called Wild White Cattle of Chartley Park (*Bos taurus*, Linn.) Other herds of aboriginal cattle formerly existed at Kincardine, Stirling, Cumbernauld, Cadzow, and Drumlanrig in Scotland, and at Chillingham (Northumberland), Burton Constable and Gisburn (Yorkshire), Lyme (Cheshire), Wollerton (Nottingham), Middleton (Lancashire), Holdenby (Northants), and a few other places. Most of these herds have now dwindled to extinction, and the only surviving ones are believed to be those of Chartley, Chillingham, and Cadzow. These differ considerably in form, colour, general build, and size and curvature of the horns. The cattle of Chillingham have red or brown, while those of Chartley have black points. Again, the Wollerton and Burton Constable herds were polled, as were at one time those of Cadzow.

Sir Oswald Mosley,[1] after referring to the disappearance of the wild boar and other animals from our forests, says: "The herds of wild cattle, from which our last enclosed forest of Needwood or Neatwood derived its name, would undoubtedly have shared a similar fate had it not been for the provident care of William, Earl of Derby, who in the reign of Henry III. conveyed some of them to his park at Chartley, where the breed has been carefully preserved, and is still kept in its original purity under the vigilant superintendence of his descendants, the Earls Ferrers." This fortunate rescue took place, no doubt, in consequence of the passing of the Act of Parliament known as the "Charta Forrestæ," in the ninth year of Henry III. (1225), which enacted in chapter x. that all land which had been afforested by Kings Henry II., Richard I., and John, except the proper demesnes of the Crown, should be disafforested and freed from the forest laws, so as to remit their rights to the former owners. When this disafforesting took place, the cattle, deer, and other game, being no longer under the protection of the very stringent game laws, soon diminished, and ultimately became exterminated. The extract we have given shows the antiquity of the Chartley herd of cattle; but as to their origin, and from what stock they were originally derived, there has long been a doubt and considerable controversy amongst zoologists. The two theories set up as to the ancestry of these animals were, either that the breed was indigenous and directly descended from the extinct species, *Bos primigenius*, or that these park cattle are the feral descendants of domestic cattle imported from abroad. During recent years the subject has been very exhaustively investigated by Mr Hedger Wallace, who gives the result of his inquiries in two admirable papers,[1] with a very complete bibliography of the subject. In supporting the opinion that these cattle are descended from a domestic breed he sums up the evidence as follows :—

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[1] Natural Hist. of Tutbury, 1863, p. 16.

1st. They are of the same species as domestic cattle, and breed readily with them.

2nd. They go with their young precisely the same time.

3rd. Their bones are fine, while those of the Urus, their supposed ancestors, are coarser even than those of the Bison.

4th. They calve at all seasons.

5th. Instead of being wild, the difficulty in the case of wild park cattle is not so much to tame them as to keep them wild.

And further, after commenting on the remains of extinct species of cattle and Italian cattle, he draws the following conclusions :—

1. The ox, common and universal throughout Britain, and we may add Ireland, at the time of the Roman conquest, was the Celtic Shorthorn, the *Bos longifrons* of Owen.
2. The animal was small and dark-coloured, and such we find to be the existing type of animals in the regions to which the Celts were ultimately driven and confined.
3. At the time of the Roman conquest the Gigantic Ox, *Bos primigenius*, was extinct in Britain, while the Celts had domesticated the *Bos longifrons*—the Celtic Shorthorn.
4. This animal was utilised and consumed both by the Celts and Romans.
5. The Romans, for draught and ploughing, preferred dark-coloured oxen. For religious rites and ceremonies, public and private, white oxen were necessary.
6. These white oxen were to be found in various provinces and colonies of ancient Rome as domesticated breeds, and the descendants of these cattle are to be found within the same areas to-day practically unchanged, as we find when we compare them with the representations of their ancestors in wall-paintings, sculptures, coins, and gems.
7. That such cattle, carrying with them the prestige of sacrificial animals, admired, selected, and preserved, were brought into Britain, we know from the Roman middens. Their size and the lyre-shaped form of their horns when compared with the native Celtic Shorthorn admit of no mistake.

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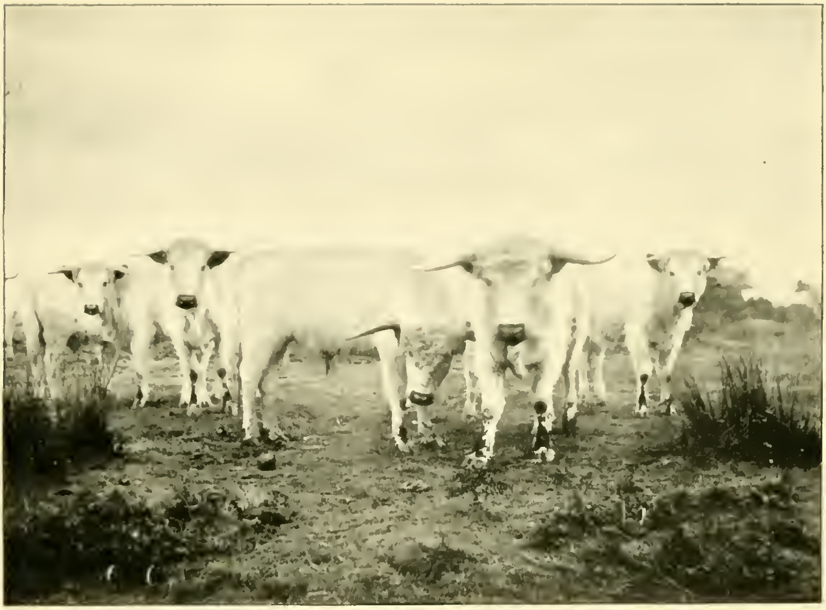
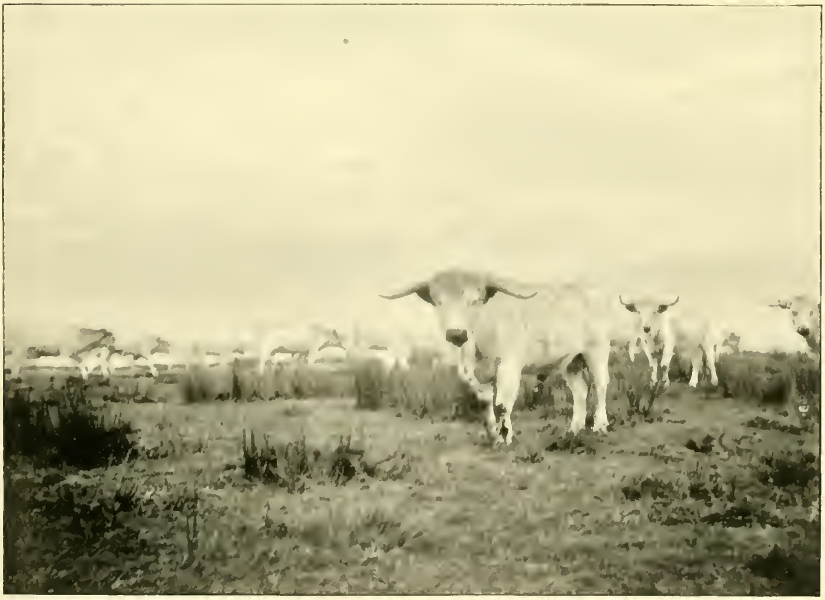
[1] "White Cattle, an Inquiry into their Origin and History." Trans. of Natural Hist. Soc. of Glasgow, 1897-99.





Photos by Rev. C. F. Barnwell. *Copyright F. N. Q.*

CHARTLEY CATTLE.

And finally Mr Hedger Wallace says:—

> The white breed which we are in the habit of calling "park cattle" and "white cattle" can only be the descendants of a domesticated breed let loose, for they retain and possess all the useful properties of domesticated cattle as permanently as the wild horses of the savannahs of South America and the steppes of Tartary now do, and we know these horses are descendants of the domesticated horse let loose. . . . The source of origin of the present English herds of white cattle is probably Scotland. . . . We cannot but agree with the opinion expressed by Professor Owen (*re* Chartley cattle)—namely, that they are descended from domestic, or rather domesticated, cattle, introduced by the Romans, which became half wild from breeding together for many years in an unreclaimed state.

Professor Boyd Dawkins in 1899 came very much to the same conclusion, and then stated that in his opinion—

> 1. The beautiful Chartley breed were originally introduced into this country, along with the closely allied breeds of Chillingham and other places, in a domesticated condition from the Continent, where they had been carefully selected by man during long ages.
> 2. They were introduced about the time of the English or Danish conquests.
> 3. And lastly, that the shyness and wildness of the breed is due to the fact of their never having been confined in small enclosures where they would come into close contact with man.[1]

There the matter rests at the present time, and every impartial reader, after a careful perusal of the papers from which we have quoted, will no doubt agree with the writers in the conclusions at which they have arrived: that the so-called *Wild* White Cattle of our parks are descended through a domestic strain, and further, that they have preserved their distinctive characteristics by careful selections from time to time, and by killing off all calves which vary in any way from the type of the herd.

The most important of these characteristics in the Chartley herd are a heavy and deep, almost rectangular, body, with a long and level back. The horns are long, growing out of the head almost horizontally, then turning slightly downwards, and curving upward at the tip. The legs are short and stout. The colour is white, but with jet-black ears, muzzles, hoofs, and horn-tips. The hair is somewhat coarse, with a mass of curly hair between the horns in both sexes. The horns of the bulls are often shorter and straighter than those of the cows. The only varieties in markings are either a "ticking" of black on the legs or an entirely melanistic variety, and in the latter case the calf is always killed. The old keeper who attends these cattle explains the tradition "that there is always a death in the Ferrers family when a black calf is born," by saying that the fact is true enough that a black calf does portend a death, but it is its own! In habits the cows conceal their young, and it is dangerous to approach too near to a cow with a young calf or to get between them. The herd when approached by strangers at once show alarm, and start off at a gallop for a short distance and then wheel round and face their supposed foe, the bulls in front, the cows next, and the younger animals and calves in the rear. It is scarcely necessary to say that the cows do not allow themselves to be milked. In winter, however, they all become more docile, and allow their keeper to feed them in open sheds erected in a sheltered ravine in the park. In summer they feed upon the coarse grasses and in winter upon dried bracken and coarse hay.

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[1] Transactions, North Staffordshire Field Club, 1899, p. 48.

In April 1851 the herd consisted of 48 head,[1] in 1873 of 27, in 1874 of 25, and in June 1877 of 20 animals,[2] made up of 1 nine-year-old bull, 1 five-year-old bull, 1 bullock, 5 or 6 young bulls, 2 young bull-calves, and 9 or 10 cows and heifers. At one time the number became reduced to only 17, this diminution being probably due to the cattle-plague (rinderpest), which is said to have attacked the herd about the year 1866. In May 1885 they had increased to 28, in April 1895 to 43, and in February 1898 the herd was in a most flourishing condition and numbered 53 head, comprising 3 old bulls, 2 young bulls, 2 bull-calves, 35 old cows, 8 young cows and heifers, and 3 young calves born since the beginning of that year. There is a rumour that fresh blood had been introduced into the herd about this date, no doubt accounting for its increase in numbers, which are said to have once reached 60. Since 1898 misfortune appears to have again fallen upon these interesting animals, for in April 1902[1] we find them reduced to only 14—and many of these were then in a sickly condition—through a tubercular disease. These 14 head were made up of 1 five-year, 1 three-year, and 1 two-year-old bull; 1 bull-calf, 7 cows, and 3 calves. These survivors have now been separated, and one young bull and three young heifers have been removed to a distance from the rest, which are left to roam their native park. By this means and the careful attention they receive from their keepers, and the veterinary adviser, it is to be hoped that these fine animals, which are of national interest, may yet be saved. It is feared that by in-breeding the stock has become weakly and depreciated, and unless fresh blood is introduced (say, from the old Welsh breed, which bears a strong resemblance to the Chartley herd both in colour, size, and length and shape of horn), or from some other kindred stock, Staffordshire is in danger of losing altogether one of the most interesting zoological ornaments of the country.

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[1] Extinct British Wild Animals, by J. E. Harting, p. 231.

[2] Zoologist, 1878, p. 276.

There are other denizens which share the home of the Chartley Cattle. Any one traversing the park will see herds of Red and Fallow Deer living in perfect harmony with the lordly cattle, multitudes of wild Rabbits, and possibly a few Stoats still survive the traps of the keepers. Voles also (both the common and Red bank Voles), Field-mice, Shrews, and their natural enemies the Weasel and the Adder, are frequently to be seen, as well as an occasional Fox or Badger. Of birds, the Curlew haunts at times the marshy parts of the park, and the Wheatear the little hillocks; the Whinchat, Skylark, Lapwing, Woodpecker, and Meadow Pipit fly up before the intruder in this wild sanctuary; but where are those noble birds the Buzzard, the Kite, the Kestrel, the Merlin, and the valuable Owls? Alas! the cruel pole-trap in an open spot near the wood, with open iron jaws awaiting their victim, accounts for their absence. Not till the keepers' ignorance as to the true value of these birds has been dispelled by "Nature study" can we expect, if ever, to have this old-world park once more enlivened and beautified by the presence of its native birds.

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[1] The 'Field' for 3rd May 1902, p. 678.

We are indebted to Rev. C. F. L. Barnwell for the latest photograph of the Chartley Cattle, from which our plate is taken.

Note.—Since the above paper was written we hear that the Chartley herd has become reduced to only a dozen head.

Newts in Spring.

By Rev. Gregory C. Bateman.

All the members of the Salamandridæ are very interesting, and some of them are most puzzling to those who take an interest in natural history. The only members of this fairly large family which are found in Great Britain are three species of the genus *Molge*—viz., the great crested newt (*Molge cristata*), the common or smooth newt (*M. vulgaris*), and the palmate newt (*M. palmata*), whose adult representatives are now making preparations to leave their winter quarters in cavities under stones, holes in walls, crevices in rocks, hollows in trees, and occasionally in damp cellars in houses.

In spring, like birds, newts are seen at their best, the males being particularly attractive in their dress of many and harmonious colours, and their magnificent crests. Very different is their appearance at this time of the year to that when, as having obeyed the command "Be fruitful and multiply," they left the water and retired into the greater privacy of a terrestrial life.

Mature newts live in pools, ponds, lakes, and slow-running streams during the months of April, May, and June. And it is while leading an aquatic life that they reproduce their kind. To us (and to them also, I expect) this is the more interesting period of their existence.

As these Batrachians, having no gills in their perfect state, are obliged from time to time to come to the surface of the water to breathe, it can be soon discovered, after a few minutes' watching, whether a certain piece of fresh water contains these creatures or not. With their limbs pressed backwards against their bodies, and propelled by their powerful and compressed tails, they may be plainly seen as they ascend for air. Then, if it is wished, and they happen to be near enough to the bank, they can be captured without difficulty by placing a small land-net under them just before they turn to descend. They also may be caught by tying a worm to a piece of thin string and "fishing" for them. A hungry newt—and a newt seems to be generally hungry during its breeding season—will seize the worm and hold on to it with such bulldog-like tenacity that it may be quietly lifted to the bank.

As all the British newts readily submit to a life in captivity, their interesting method of caring for their eggs, the growth of the embryo within the egg, and the development of the tadpole, may be easily watched through the side of a well-appointed aquarium.

Unlike the frog and the toad, the female newt does not lay a second egg until she has carefully secured the safety of the first, and so on, provided that the water contains weeds possessing leaves suited to the purpose for which she requires them. Should there be no leaves which can be made use of by her, she will allow her eggs one by one to drop to the bottom of the water, where they—some of them—will be hatched, provided that they are not eaten by one of their many enemies, such as the water-louse (*Asellus aquaticus*), the mud-snail (*Limnæa peregra*), tadpoles of frogs and toads, or some other fresh-water scavengers.

The female newt seems to be very careful in the choice of the leaf in the fold of which she wishes to place her egg. Not only does she smell it and feel it, but even occasionally tests its pliancy by bending it in her mouth. When she has succeeded in finding a leaf which satisfies her, she backs towards it as if to sit on it, but instead of doing so folds it with her hind-feet and deposits an egg within the fold; and having done this, she will frequently, to make matters more secure, take the folded leaf in her mouth and press it gently and more closely upon the newly-laid egg it contains. As the egg is covered with a sticky secretion the leaf readily adheres to it. After having rested for a short time, this producer and careful disposer of batrachian eggs will seek for another suitable leaf and repeat the operation just described.

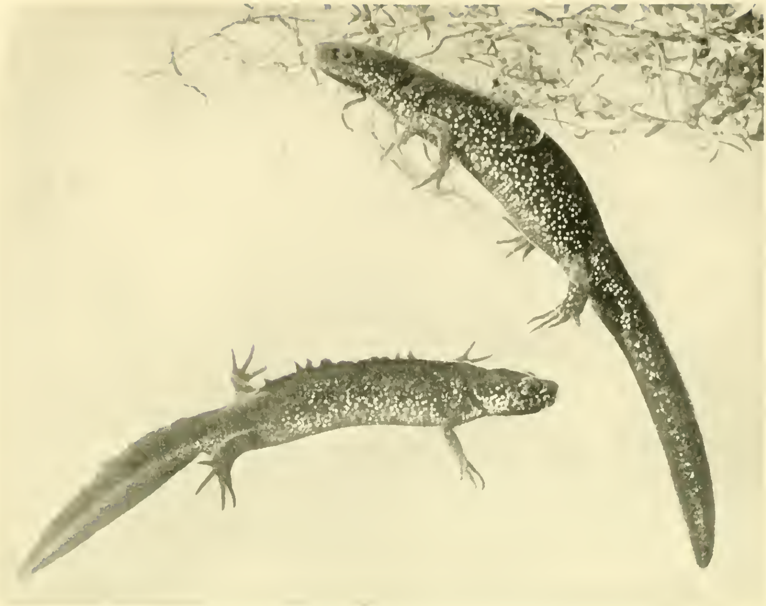
As the embryo within the glutinous envelope in which it floats and rotates grows, the leaf begins slowly to unfold, showing as it does so more and more of the egg, and so allows the interesting development of the young creature it contains to be watched, if wished, by the help of a magnifying-glass, through the sides of an aquarium.

Within a few days, according to the temperature of the water, the young newt, as it grows within the egg, gradually folds in half, and at the same time gills slowly appear on the sides of its neck. As the little batrachian gains strength its movements become more and more vigorous, until by one stroke it is able to burst the envelope by which it is imprisoned, and thus attains its freedom.

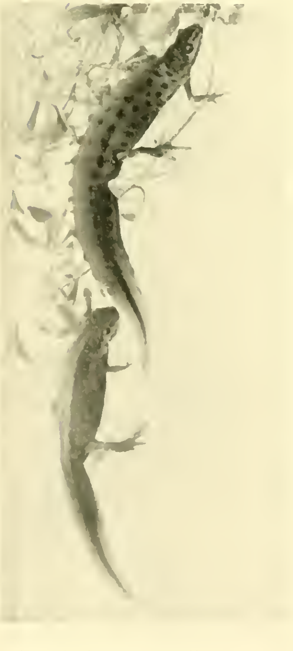
The newly hatched tadpole is so slender and transparent that it is no easy matter to find it again, even in a small aquarium, after having once lost sight of it. Indeed it would very likely escape observation altogether were it not for its jerky movements and its very brilliant eyes. During the earliest hours of its existence the little creature's movements are very erratic as it darts from spot to spot, holding on to its various resting-places by means of the tiny claspers provided for that purpose.

Unlike its relative, the tadpole of the frog, the young newt's fore-legs appear before the hind ones. About the time the latter are growing the branchiæ are at their fullest development, and have now become most interesting subjects for the microscope, when the "branchial circulation excites the greatest delight and surprise" (Bell).

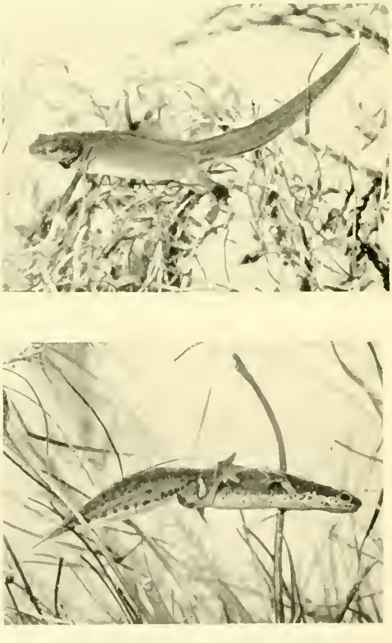
After the production of the hind-legs lungs are gradually developed, while the branchiæ are as gradually absorbed. On the disappearance of the latter the young newt leaves the water, and does not return to it until it has obtained its maturity. During the three years which elapse between the end of its tadpolehood and its return to the water for breeding purposes, it lives in damp places, feeding on various small creatures, and hiding under stones, in hollows, and



MALE AND FEMALE GREAT NEWTS.



MALE AND FEMALE SMOOTH NEWTS.



Photos by Douglas English.

MALE AND FEMALE PALMATE NEWTS.

BRITISH NEWTS.

the like. When for some reason or other, such as lateness of hatching or insufficiency of suitable food, the young newt fails to absorb its gills and produce lungs, it spends the winter in the mud at the bottom of the water, which it will not leave until late in the following spring.

The old newts, having gradually lost their spring crests and bright colours, desert the water about the beginning of July to recommence a less exciting life upon land. During their sojourn in the water they frequently shed their "skins," which are often sloughed whole, and are eaten, as in the case of toads, by their owners. A perfect slough of a newt is an interesting object, and may, with care, be spread out by means of a small brush upon a piece of white paper, where it will look, when dry, like a delicate sketch in sepia. Previous to their sloughing, newts, as in the case of toads and snakes, become dull in appearance and sluggish in their movements.

The great crested newt (*M. cristata*) is the largest of British newts, and the palmate newt (*M. palmata*) is the smallest; while the common or smooth newt (*M. vulgaris*) is the most plentiful. The palmate newt is found in various localities, and is sometimes, as here in Devonshire, more numerous than either of the other species.

Newts, in common with some other animals, have the strange power of reproducing lost limbs—at any rate during that time which they spend in water. These Batrachians while living in the water feed upon worms and other small creatures, such as larvæ of insects and the like; but during the earliest part of their tadpole life their food chiefly consists of tiny fresh-water crustaceans, such as the Daphniæ, the Cyprides, and the Cyclops. Newts during the breeding season are not seldom guilty of cannibalism—the bigger ones feeding upon their smaller relatives.

The eggs of newts may be easily obtained for the purpose of observation by floating small bunches of certain aquatic weeds, loosely tied together, in those waters in which these Batrachians are known to abound. After about twenty-four hours' immersion in the water the weeds on examination will be found, in all probability, to contain several eggs, and those portions to which the ova are attached may be readily placed in some convenient and transparent vessel. The plants recommended for this purpose are the Canadian water-weed (*Anacharis alsinastrum*), the vernal water-starwort (*Callitriche verna*), and the autumnal starwort (*C. autumnalis*).

Notes on the Nests and Eggs of Birds.

By Rev. M. C. H. Bird.

The other day I heard a doubt expressed as to the authenticity of a picture in 'Our Bird Friends' by the Messrs Kearton, in which book a nest of the great crested grebe is shown in close proximity to that of a coot, both nests containing eggs. Having assisted in the procuration of that photograph, I can not only vouch for its truth to nature, but also assert that on the same day an almost exact counterpart of that plate might have been obtained on the other side of us, and within a hundred yards of where our flat-bottomed boat was stayed whilst the first picture was being taken. We were in a quiet corner, beloved of birds of various species at every season of the year, and bearded tits, reed-buntings, water-rails, yellow wagtails, snipe, wild duck, plover, and redshank were all breeding within sight of our boat, whilst we could also watch a small colony of rooks busy on tops of the trees in a carr near at hand. The close proximity of the coot's and grebe's nest suggests the thought, Why should birds building so near together make any different kind of nest? and further, Why do not *all* birds build similar nests, and lay similarly shaped and similarly coloured eggs, of uniform size in proportion to the dimensions of the parent? How have the infinite varieties of nests and eggs been brought about?

The earliest known egg-laying animals produced eggs which were covered with a membrane only—no hard shell. Shells and their subsequent variations, together with more or less elaborate nests to receive them, were probably evolved for protective purposes during that constant struggle for existence which has been going on for countless ages in the history of the world. The eggs of all known reptiles (from which birds are supposed to be an offshoot) are whole coloured as to their shells, white, or dingy yellow—with perhaps one exception, the Tuatera lizard of New Zealand being said to show a distinct tendency to produce a coloured rust-spotted shell. Primarily the eggs of all birds must have been white, from the inherent colour of the salts of lime and magnesia of the shell ('Zool.,' 1889, p. 547). And, going back to the earlier forms of bird-life, fossil eggs of the extinct dinornis and æpyornis have been found to approximate in shape, colour, and texture of shell to those of the ostriches of the present day. Ostriches—belonging to the ratite or keel-less breast-boned birds—are structurally the most reptilian family of avian existence; they lay elliptic-shaped eggs, of one tint, with hard flinty shells, which are highly polished in South Africa, rough surfaced in North Africa; they are polygamous, several hens laying in one nest. Cassowaries do likewise, but their eggs are green, and rough shelled. Emus lay from 9 to 13 eggs, and the male only sits. The apteryx lays but a single egg, and deposits it in a hole in the ground. Amongst carinate or keel breast-boned birds there are still some peculiarly reptile-like affinities. Thus in the hoatzin, for instance, the chicks have claws at the end of their bastard wing bones, and these claws they use, like quadrupeds, for creeping about. Our coot has a similar claw, though not so fully developed, and also in its infancy makes use of it for a similar purpose. This bird and its allies, moorhens and rails, which have also wing spurs, build nests of rough construction. The Megapodes make in place of nests huge earth-mounds, wherein they place their eggs to incubate, our own grebes approximating to the same habit. (Cf. 'Birds of Norfolk,' vol. iii., where Mr Southwell relates his experience of testing the heat of three great crested grebes' nests, their temperatures ranging from 67° to 73° whilst the maximum shade temperature of the day was only 58°). Penguins lay two greenish-white eggs on the ground, or in a hole in the ground, with practically no nest: these lowly organised birds swim with their wings and use their feet as a rudder only. Our guillemots and razorbills also make great use of their wings when under water, and they, too, make practically no nest. The least highly developed bird which lays a highly coloured egg is the tinamou. Professor Newton says: "They are remarkable objects, curiously unlike those of any other bird; their shell looks as if it were of highly burnished metal, or glazed porcelain, presenting also various colours, from pale primrose to light indigo, or from chocolate-brown to pinkish-orange. In form they are more or less globular and completely opaque." Thus birds so low in the scale of organisation as ostriches, emus, cassowaries, penguins, and tinamous lay eggs varying in number from one to many, globular or elliptic in shape, white or whole coloured, and with rough or highly polished shells.

If we compare these facts concerning the life-history of birds with some of the characteristics of the eggs and nesting habits of reptiles, we cannot help noticing how nearly they correspond. As we said before, practically all reptiles' eggs are white or dingy yellow. Marine tortoises lay globular eggs—a few elliptic; land tortoises lay very few eggs, crocodiles very many. Neither tortoises nor lizards incubate, but some of the latter are ovo-viviparous. Pythons coil round their eggs to hatch them. The alligator nests like the megapodes. Here, then, we see numerous traits in which both the shape and colour and number of eggs, the nesting and incubation, of reptiles and birds approximate very closely. We have seen how crocodile-like are the nesting habits of the megapodes, and how reptilian are many of the eggs of the lower forms of present-day bird-life,—the eggs of the crocodile being enclosed in a calcareous shell and laid in holes made in the sand or mud of the river-side, where they are left to be hatched by the heat of the sun; or, as is the case with some American species, deposited in hillocks which the reptiles raise for themselves and hollow out, filling the cavity with leaves, when the eggs deposited therein are hatched by the heat generated by the decomposing mass,—one great crested grebe still making, as before mentioned, a modified use of the same expedient. We may therefore safely trace the nesting habits of birds to a reptilian origin.

The marvellously beautiful variety of colouration, the great diversity of shape and size and substance, in the shells of birds' eggs, the complexity of structure, and the difference of situation in which the nests of various birds are placed, are not works of chance, but the result of the secret, silent, and vastly prolonged workings of those laws of nature with which the writings of Darwin especially have made us familiar. *Exactly how* the infinite variety of ground tints and subsequent blotches, spots, or markings upon previously whole-coloured eggshells were brought about we cannot say; but *why* birds' eggs are now produced in size and colour manifold, and laid in domed or open nests of rude or skilful architecture, we may safely say is for the welfare of the several species. The necessity of protectively coloured eggs or of cosy nest varies with the previous life-history of the parents and the subsequent safety of the young; hence we find a variety of nests and a still greater variety of eggs. Those birds which lay many eggs and build most elaborate nests are themselves more fragile, or have more foes to contend with, than the bird which lays a single egg and makes no nest whatever to receive it, or any attempt to conceal it; and those eggs which, in consequence of their ground colour and markings, can only with great difficulty be discerned in the midst of the natural surroundings in which alone they are laid, are those which could be protected no better by any of the various means which are resorted to by birds of different nesting habits. Take the golden-crested wren, compared with the guillemot, as an example of the first statement, and the ringed plover as an instance of second assertion. The eggs of this latter bird must be large, in order that the young may be able to take care of themselves partly as soon as they are hatched. Now, if these proportionately large eggs were concealed from enemies by being covered with down as those of a duck, or laid in a large nest like that of a rail or a rook, or domed over as a wren protects hers, the very attempt at such concealment would defeat its own object, for the ringed plover is a bird of the bare sea-shore. Neither reduction in the size of its eggs—sufficient to decrease probability of their discovery—nor the covering of them with down or grass or leaves would be possible under the present circumstances of this bird's life-history. It is impossible to suggest any more suitable means of hiding its treasures than protective colouration of the eggs themselves; and this plan the ringed plover, unconsciously perhaps, but assuredly most successfully, adopts. The rudest and most simple form of bird's nest is then that made by the lowest forms of bird life, whilst the most elaborate structures are reared by the most highly organised species. Thus ostriches merely scratch holes in the sand; then we come to birds which merely fill or line those holes with surrounding vegetation; the next step is to raise the eggs above the surface of the land or water upon which the nest rests.

Whether all birds were originally arboreal, and their young nidifugous (W. Pycraft, 'Pop. Science,' December 1902), or, according to the old idea, terrestrial and nidicolous, although we can point to no present-day connecting-link between præcocial and altricial habits in British breeding-birds, we nevertheless have many instances in which former, or even present-day, ground-builders sometimes place their nests at some altitude from the surface of the earth; and we find much aberrancy in the architecture of birds of one and the same species, even individuals of the same family sometimes choosing very different sites, and composing their nests very differently. The present-day methods of green sandpiper, heron, crow, cormorant, stock-dove, the swallow family, and house-sparrow, for instance, show a remarkable amount of adaptation to varying circumstances; whilst the plover, grebe, rook, thrush, hawfinch, chaffinch, and long-tailed tit, being constant in their breeding habits, may have arrived at what is the most perfect for the comfort and safety of their offspring, and these birds may be taken as representing either rising or descending steps in the scale of avian architecture, according as we presume the earliest forms of bird-life to have been altricial or præcocial.

From the survival of many birds which still preserve the ancient reptilian characteristics of laying white or uniformly tinted eggs on the ground and covering them up, we may argue that these species have had no necessity to improve their ancient methods for the perpetuation of their species, either in the construction of their nest or in changing the site thereof; whilst some have found it necessary to merely add a second covering of colour to their eggs in the shape of spots or blotches. Some ground-builders—early breeders—lay their eggs in fairly conspicuous places, apparently aware that by the time the whole clutch shall be deposited, and incubation commenced, vegetation will have so far advanced around them as to conceal the sitting parent. For instance, a partridge's or pheasant's nest is frequently easy to find whilst it contains one or two eggs only; but wait a week or ten days and then go and look for it again, and its discovery will be far more difficult. Birds which make no nest whatever are those which lay their eggs in inaccessible places, or hide them in tunnels in the ground, or in holes in trees. No hard-and-fast rules can be drawn as to site or construction of nest corresponding with the size or colour of the eggs in any species, but, generally speaking, birds which lay but one egg make no nest, those which lay two but little, whilst those which lay many make much provision for their reception, and the smaller the egg the more careful and elaborate is the nest prepared for its protection. Birds generally are very secretive about their nests, and these, when no attempt at concealment is made, are placed in high trees or upon precipitous cliffs or in colonies.

The number of eggs laid by a bird may depend upon four things:—

1. How many that bird can cover.
2. How many young it can provide for.
3. The enemies the species has to contend with.
4. The age of the female parent. Some birds—cormorants, for instance—which lay two eggs in their first clutch will produce three sometimes in subsequent seasons. Young mute swans commence with four or five, whilst a good old bird will lay from nine to a dozen eggs. I have myself seen twelve cygnets reared. Domestic fowls produce a greater

number of eggs in their first year, making up in weight only during their second season. With wild birds the eggs of the second year are usually larger in size than those of the first season. This is so noticeable with those of the coot that I have frequently heard the first attempts spoken of by our Broadland marshmen as "pullets' eggs."

We may take the Plover family as representative of the first specification—namely, that the number of eggs in a clutch depends upon the size of the incubating parent. The peewit could not cover more than four eggs, and even that this may be possible those four eggs must be of a certain uniform shape and arranged in a special manner in the nest. The necessity for the eggs being so comparatively large in proportion to the size of the bird which produces them, arises from the nidifugous habits of the young, which must be highly developed on hatching. In proof of the second assertion, reference may be made to the thrushes. How could they feed and tend as large a brood as the partridge? The former parent birds have not only to find the food, but also to convey it to their offspring: this food, chiefly consisting of earthworms, is proportionately heavier to carry and more difficult to procure and prepare than is the insect food of the tits, which are consequently able to provide for more numerous families. The unique breeding habits of the cuckoo have been partly accounted for upon the supposition that the parent birds laying many eggs could not provide sufficient food for a large brood. Owls surmount a similar difficulty by depositing their eggs at unusually long intervals, commencing incubation after the first egg is laid, and leaving the later eggs to be kept warm by the earlier hatched young, whilst the mother is away hunting for food. The number of eggs laid by any species seems sometimes to have some connection with the number of enemies and adverse circumstances which that species has to contend against, whether the young be nidicolous or nidifugous. Thus those birds which practically spend the greater part of their existence upon the surface of the earth—game-birds on land, and wildfowl on water—lay many eggs, as do also the most fragile of British birds, tits and wrens.

The number of eggs laid in one nest is fairly uniform in each species, though varying greatly in different species. Some large and powerful birds which are colony breeders, such as the gannet, guillemot, razorbill, and puffin, lay one egg only. The black guillemot, divers, and pigeons lay two. The latter family present much difficulty in their breeding habits, and the reason for the black guillemot producing one more egg than its common relative may be a provision of nature, lest with its more restricted range and perhaps less robust frame it should become extinct ere the life-work of the species in preserving the balance of nature is accomplished, for here we are dealing with a bird whose domestic economy is not disturbed by man.

We next come to those few birds which lay three eggs at a clutch—the oyster-catcher, cormorant, and sand-grouse. These are all exceptional cases and connecting-links between related families which lay either two or four eggs.

The size of egg laid by any given bird depends more or less on three things:—

1. The size of the bird itself, and in a less degree upon its age and health.

2. Upon the state or development of the young at hatching time.

3. Upon the number of eggs contained in a normal clutch.

The first part of the first rule generally holds good, the second part needs the following explanation. The eggs of birds in their first year of laying are usually smaller than those of over-yeared breeding-birds of the same species. This is especially noticeable in thrushes and blackbirds, coots and moorhens. Again, the health or state of the egg-producing organs will influence the size of the egg—the last of a clutch, and especially of a second clutch, frequently being very small, and sometimes yolkless. Trading upon this fact, I have known schoolboys indulge in the practice of constant "robbing" to add "varieties" to their collections. Late clutches laid by those birds which naturally rear two or three broods in a season often afford illustrations of hard-worked organs producing poor results; actual disease or deformity in the producer will also result in defective produce. Secondly, the size of eggs depends very much upon the degree of development the young attain at the time of hatching. Those which produce nidicolous young are relatively small, whilst those of nidifugous birds are large in proportion to the size of the female parent. Wading-birds afford a well-known example of this rule. Thirdly, birds which lay many eggs at a time must have those eggs relatively small, or they would be unable to successfully incubate a normal clutch. Thus we may argue that "the size of an egg usually, but by no means constantly, bears some relation to that of the parent bird." The well-known habits of the cuckoo present a familiar exception to this rule also: placing its eggs, as it usually does, in the nests of birds much smaller than itself, it is necessary that such should be the case, for if they did not approximate in bulk to the eggs of the foster-parents they would neither be incubated nor owned by them.

As examples of the differently sized eggs laid by nearly sized birds, the following are contrasted in the South Kensington Museum, in cases illustrating the general characters of birds' egg. Side by side are placed the eggs of the nidifugous curlew, and of the nidicolous raven, two birds of about equal size, whilst their eggs are very far out of proportion to the size of the producers. Then come those of the guillemot and the raven, where the proportion is as ten to one in favour of the bird of nidifugous habits. Thus reasons for these discrepancies are not far to seek, for young ravens remain long in the nest, whereas young curlews and guillemots are far more fully developed at the time of hatching, the larger egg containing a larger supply of food for the greater growth of the embryo. Then, again, the number of eggs laid by a raven may be six or seven, whilst the guillemot lays but one, either bird thus having about the same amount of substance and surface to cover and keep warm during incubation. Next, the eggs of the snipe and blackbird are contrasted, the progeny of the one being able at birth to run with the broken shell on its back, whilst the young of the latter are born naked, blind, and helpless. Then the similarity of size is shown in the size of egg laid by two birds so dissimilar in bulk as the cuckoo and tree-pipit, these eggs being deposited in similar nests, and the young resulting from each being equally nidicolous.

The shape of birds' eggs varies considerably from globular or spherical to different modifications of the elliptical or oval — the extreme pyriform of the Waders being the greatest departure from the reptilian shape. The bright and varied colour of many birds' plumage is utilitarian, as is also the beauty of some of their nests and eggs; but there is no question of love of display involved in the colouration of eggs or the construction of nests, and so also the laws which govern the shapes of eggs are those of expediency. As we have seen, where the eggs are large in proportion to the size of the bird which is to incubate them, the eggs must be of such a shape as to fill the least possible space; and when no nest is made to receive them, they must, for their best advantage, be so shaped as to be least liable to be tumbled or blown away from the place wherein or whereon they are deposited. This accounts for the pyriform shape taken on by the eggs of Waders and some cliff-breeding birds. The spherical shape persists only with such birds as lay in places where there is no danger of dislodgment. The kingfisher, for instance, makes its rude nest at the end of a tunnel in the ground, whilst the tawny owl chooses a hollow tree for its lying-in chamber. The perfect ellipse is represented by the eggs of the nightjar, and very nearly by those of the sand-grouse and swift. Those in which the ellipse is most perfect lay two eggs only, and brood over one on either side of their sternum. The biconical specialisation occurs amongst the grebes, the greater weight being in the middle of the egg, and the ends thereof being equally balanced tends to the horizontal position being maintained by them in the easily compressible nest.

(*To be continued in our next.*)

The Great Black Woodpecker (*Picus Martius*).

By Reginald Haines, M.A., M.B.O.U.

Though the most unlikely birds, such as the Vultures and some purely American species, have been admitted into the British List by our ornithological authorities, these same persons set their faces as flint against the inclusion of the noble *Picus Martius*, on the following grounds: that this Woodpecker, though a bird of powerful flight, is most unlikely to leave its Continental habitat, and has in fact never been recorded even at Heligoland; that there are no suitable pinewoods for it in England; that no specimen now in existence can be proved to have been obtained in this country; that no mere *observation* of any naturalist, however competent, can be accepted unless the *corpus vile* of the bird itself is brought into court.

Now it would indeed be absurd for me, who am the veriest amateur in the subject and at most only a field naturalist, to set my judgment on any matter purely ornithological against that of the authorities in this present case ranged on the other side. But this is a question not so much of ornithology as of evidence, and it seems to me that the evidence that is to hand has been treated in very cavalier fashion by those sceptical ornithologists who will trust no one's experience but their own, and whose pernicious formula, "What's hit is history, what's missed is mystery," has sounded the death-knell of many a rare bird that might have been chronicled and yet allowed to live.

Starting with a preconceived opinion that a Great Black Woodpecker could not occur in England, they have brought all their ingenuity to bear upon discrediting the instances alleged to have occurred. These are, however, so numerous and varied in character that almost any other bird would have been added with acclamation to the avifauna of these islands on the strength of even half the number.

It is certainly true that many, if not most, of the cases formerly given of the occurrence of *Picus Martius* were found, on examination by Mr J. H. Gurney, to be due to misconception, confusion with other birds, and even sometimes to fraud; but there is a residuum that cannot be explained away in this wholesale fashion. Any one can satisfy himself of this by examining the list given by Mr J. E. Harting in his 'Handbook of British Birds.' One cannot help thinking that it is, to say the least of it, unlikely that so many observers could have been mistaken. Nor is the bird an easy one to mistake. Its colour, its habits, its cry, are all distinctive.

But the case for the Great Black Woodpecker does not rest only upon the cases examined by Mr J. H. Gurney and pronounced wanting, whereby this species has been ignominiously expelled from the pages of Yarrell, Saunders, and others.

In Mr Bull's 'Birds of Herefordshire' we have a record of this bird from two competent observers—the late Captain Mayne Reid, who saw two Black Woodpeckers near his residence at Ross, and the late Rev. Clement Ley, who twice saw the bird. The first occasion was at Ruckhall Wood, Caton Bishop, about 1874. Mr Ley was a thoroughly good ornithologist who knew this particular bird in its haunts abroad, and on this occasion he pointed it out to his cousin, Mr Edw. du Buisson. Again in 1876 at Mount Edgecumbe, in Devonshire, hearing the loud note of the Black Woodpecker, he remarked to his companion that if they remained quiet they might see the bird. Accordingly, standing close to a thick oak coppice, they soon got a good view of it. Is it not absurd to brush aside this evidence of an expert? One of the sceptics would no doubt have gone for a gun and murdered the poor creature, without, however, persuading any other sceptic that the bird was a genuine British specimen, not escaped from an aviary, or purchased in Leadenhall Market. I unhesitatingly express my conviction that the bird seen on this and the former occasion was *Picus Martius*.

Take next the evidence of Mr E. Cambridge Phillips in his 'Birds of Breconshire.' On Whit-Monday 1885, he says, "I heard a bird's note most startling, loud, and resonant, quite unlike anything I had heard before, in forty years, as a field ornithologist,—a cry like that of a curlew when unexpectedly disturbed, but louder and more weird. . . . That it was a woodpecker, and a black one, I have no doubt. It flew with a bold sweeping flight and with its tail slightly forked." Here again what could the observer have seen if it was not the Great Black Woodpecker? What bird is black and has that peculiar flight, that loud cry?

Again, some years ago a farm bailiff in the county of Rutland, since dead, told me that about the year 1850, while walking outside Wardley Wood in the neighbourhood of Uppingham, he saw fly close past him a bird which he recognised at once as a woodpecker from its appearance and flight, but saw to his surprise that it was black. Now this observer, though familiar with all the common birds of the country-side, most of which he had shot at one time or another, knew no more about the Great Black Woodpecker controversy than he did about the sea-serpent. The sight of a black woodpecker, when he expected to see the familiar one of green and gold, evidently impressed him so much that he recollected it even after fifty years were passed. His evidence, as far as it goes, is unimpeachable. Either, then, this was a genuine *Picus Martius* or a melanism of the *Gecinus viridis*.

Information as to another specimen, said to have been obtained near Shrewsbury, and not, I think, mentioned in Mr Harting's list, has lately reached me. It is now in the hands of H. D. Crompton, Esq., of Wiston Hall, St James's Road, Edgbaston, who tells me it was originally in Lord Hill's collection, and may be forty years old.

Finally, in December 1897, Mr Harting exhibited a specimen *in the flesh*, which had been shot, beyond all cavil, on September 8, 1897, at Otley in Yorkshire. But the sceptics were equal to the occasion: this bird, they said, must be one of two released by Lord Lilford near Oundle about 1890. Is not this a long life to give so striking a bird in a country where the professional ornithologist is always on the prowl with a gun for rare specimens? It was fortunately one month too early for this bird to be identical with one which escaped from the Zoological Gardens on October 9.

As matters now stand, it would require at least three birds of this species to be shot in the British Islands before the unbelieving ornithologist would even begin to admit the possibility of a genuine wild specimen having occurred on this side of the Channel. It is therefore, I suppose, no use to mention that a Black Woodpecker has been seen at large within the last two years in Norfolk by a competent observer, J. M. Mitchell, Esq., of Monument Chambers, London.

Since the above was written the Rev. E. T. Daubeny, of Thetford, Norfolk, has stated that a cock bird was observed at Ixworth in July 1897, and three weeks later a pair at Euston Park. Three were observed at the latter place in April 1902, and one in October.

Rambles on the Lincolnshire Wold.

By A. E. Johnson.

To No. 3 of the F. N. Q. it was the privilege of the present writer to contribute a brief paper on "The Gulls of Twigmore Warren." Therein some account was given of the remarkable breeding rendezvous of a large colony of black-headed gulls at Scawby in North Lincolnshire, a hamlet situated a few miles south of Scunthorpe, the principal town (or large village rather) of the neighbourhood. It is with Scunthorpe and the surrounding district that the present paper proposes to deal. To the "tourist" travelling by road or rail through this part of northern Lincolnshire the country may seem perhaps uninteresting, though it has, to those who traverse it rightly, a fascination and a charm quite its own. But this apart, the locality is singularly rich in matters of interest to naturalist, geologist, and archæologist.

Briefly, Scunthorpe lies about midway on the Great Central line from Doncaster to Grimsby, approximately due north of Lincoln, and about ten miles south of the Humber. It is situated in the district known as the Lincolnshire Wold, and—more precisely—on the curious low ridge of "Cliff Hills" which runs northward from

Grantham to the Humber. The undulating country of the Lincolnshire Wold presents many attractive and characteristic features, not a little surprising to those whose impressions of the county are based upon experience of the southern fen-lands, and comprises some of the richest agricultural districts in the kingdom.

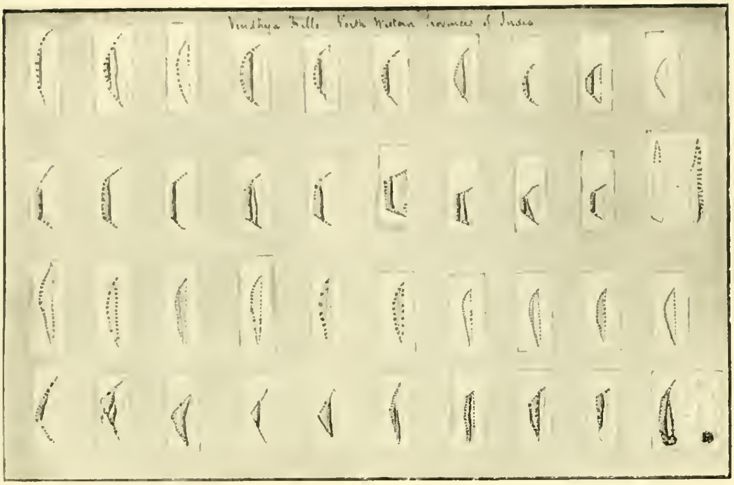
With the Gull-Ponds at Twigmore it is unnecessary to deal further here, since they were fully described in the article already referred to. In the same paper mention was made of other curiosities in natural history for which the neighbourhood is remarkable. Chief among these must be reckoned the warren at Crosby, a hamlet within a mile or so of Scunthorpe, where until very recently a peculiar breed of grey or silver-haired rabbits was plentiful. The origin of the colony seems to be generally unknown; but of its existence there is no doubt. Mr Sutton-Nelthorpe, of Scawby, states that he distinctly recollects shooting over Crosby when a boy, and testifies to the frequency of the silver rabbits and the popularity of their skins as curiosities. As might be expected, the luckless bunnies paid dearly for their peculiar distinction. Their extermination, however, came about in indirect fashion. So long as the silver skins were fashionable for use as fur and for other purposes, their owners enjoyed special protection, and were well looked after by the keepers. In course of time, however, with the changes of fashion, the skins became no longer in demand. The prime reason for protection ceased to exist, and very soon the rabbits ceased to exist also. Whether any specimens of the breed still linger at Crosby is doubtful; but if so, such are rare indeed.

Even nearer to Scunthorpe than Crosby is a stretch of open land known as Black Rabbit Warren. As the name indicates, here lived at one time a breed of wild rodents scarcely less remarkable than their silver brethren at Crosby. Tradition, however, is less clear upon the subject of these black rabbits, and information as to the period at which (if indeed at all) they flourished is not forthcoming. The warren is principally interesting at the present time on account of the numerous pools it contains, frequented at the breeding season (April to June) by an ever-increasing tribe of black-headed gulls, offshoot from the great and crowded settlement at Twigmore. The pools are commonly known as the Blackhead Ponds, from the circumstance of the purpose which they have thus served since the year 1870, when, in the recollection of an ancient keeper, the first eggs (five in number) were laid.

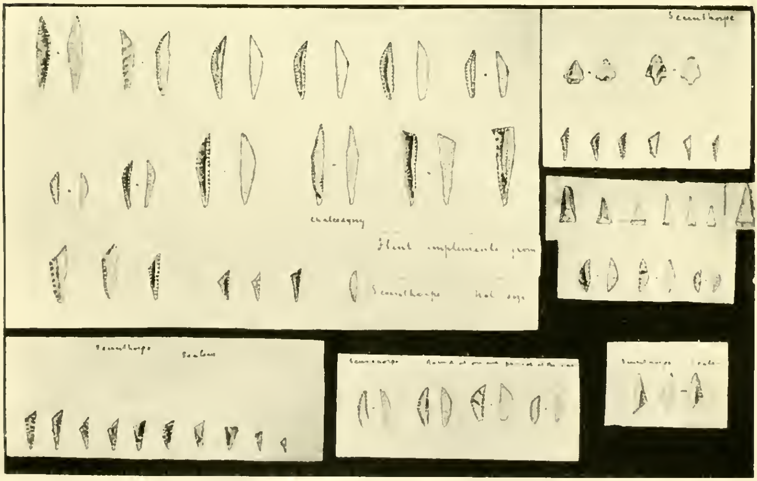
Interesting, too, to the ornithologist must be the remains at Ashby, some two miles away, of a duck-decoy which once was as profitable as any in the kingdom. Though not in such good preservation as some other relics of this old-time sporting industry to be found in different parts of the country (a few decoys are still working, notably in Essex and East Anglia), a good deal of the apparatus is still sufficiently sound to illustrate the *modus operandi* of the decoy-man. Still may be seen in the thicket the lake, and the "pipes" of the decoy, along which, by the wiles of the treacherous decoy-ducks, or the curious antics of the scarlet-coated dog, the inquisitive but unsuspecting wild-fowl were lured to their doom. In the flourishing days of the decoy the farm was occupied by a tenant and his sons most skilled in the decoy-man's art, and the strict orders of "th' owd squoire" forbade the discharging of a gun or the making of any noise that might frighten the birds within a wide radius of the encircling thicket. At all events, the combined skill of the decoy-men and the interest of "th' owd squoire," according to local tradition, resulted in an average annual take of 30,000 birds. At the proper season wild duck still come to the decoy, and would doubtless return in something like the old numbers if properly encouraged. The farm buildings are still standing and habitable, though sorely in need of a thorough overhauling. Surely here is an outlet for the capital of a country-loving gentleman in search of a paying hobby! The chief difficulty, presumably, would be the finding of a good market for the birds.

Geologically, Scunthorpe is peculiarly interesting. The district is flat and—on the surface—sandy, protected by the abruptly rising ridge of hills already referred to. Below the sand is a deposit of peat from 3 to 4 feet deep, and under the peat a bed of ironstone reaching a depth in some places of over 15 feet. This ironstone, of great commercial value, is notable for its curious local distribution, and is the cause of the half-dozen or so blast-furnaces which disfigure the otherwise fair face of this corner of Lincolnshire—mines having been exploited with great success during the past couple of decades. It is not, however, the ironstone, nor yet its covering of peat, to which we particularly wish to refer here. Our attention is directed to the loose sand on the surface, or rather to the remarkable prehistoric remains which it contains. The sand itself is somewhat puzzling. No marine remains are found in it, and as it is not lacustrine in character, it must be Æolian, or wind-blown. But whence it came at the bidding of Æolus, remains a mystery. There, at all events, it lies, heaped here and there into small mounds or barrows, to which further reference will be made presently. It is in this sand that the "pigmy flints" are found, of which the Rev. R. A. Gatty, who first discovered them in this locality, has perhaps the largest and most varied collection. So far, these tiny relics of the Stone Age have proved a stumbling-block to scientists. Doubtless by them there hangs a tale. The question is, What story of prehistoric marvels do they unfold, or can they be made to unfold?

Some twenty years ago, it appears, Mr Gatty—always an ardent geologist—picked up in the fields at Bradfield, near Penistone, a number of what he claimed to be minute, yet complete, flint implements, but which eminent authorities at first set down as mere chips from larger specimens. Subsequently a collection of pigmy flints found on the floors of caves in the Vindhya Hills were brought over from India by Mr Carlyle. Comparison showed that they were identical in every respect with Mr Gatty's specimens save that chalcedony was the component substance instead of flint. Further confirmation of Mr Gatty's contention was afforded by the discovery of similar remains at Rochdale by Dr Calley March. News of a geological "find" at



FLINT IMPLEMENTS, INDIA.



Photos by Mr Gatty.

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FLINT IMPLEMENTS, SCUNTHORPE.

Scunthorpe took Mr Gatty thither. As a result of numerous visits he has accumulated an astonishing collection of tiny flint implements, all conforming, with but few exceptions, to one or other of some half-dozen distinct types. All show unmistakable signs of having been wrought by hand, and many exhibit the marks of use. They are found generally lying in the sand, and especially in the mounds or barrows previously referred to, which Mr Gatty believes to have served in some sort as habitations. Many of these mounds are broken in, disclosing a kind of floor, whereon lie the pigmy flints, in some cases side by side with raw, unworked chips of flint. At least in one instance they were found in company with some cremated bones, and an incense-vase of rough, crudely ornamented pottery, of a pattern still used in India to-day in the ceremonial rites around the funeral pyre,—a coincidence the more remarkable in view of the Indian discoveries just mentioned.

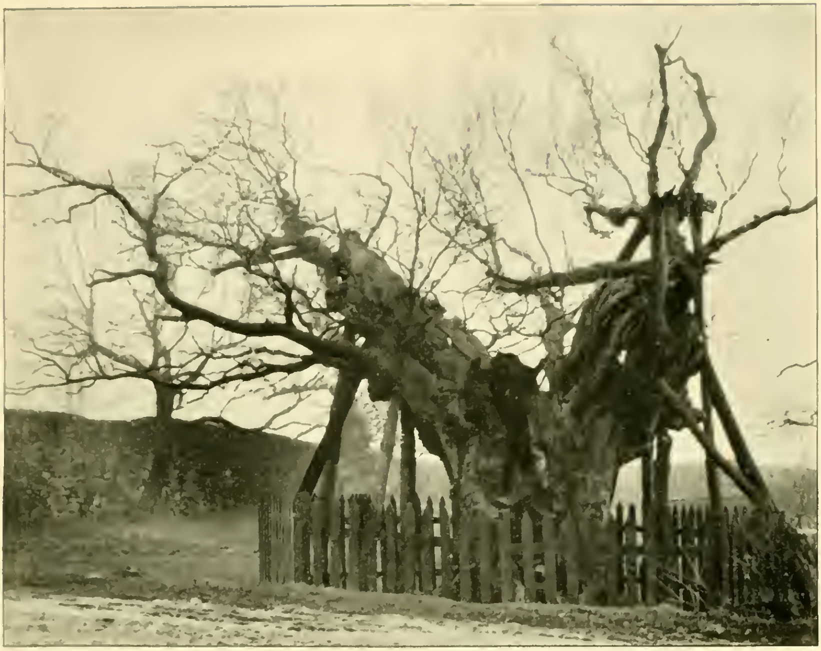
Scunthorpe has proved, perhaps, the district most prolific of these prehistoric remains, but other districts, it should be noted, have yielded them as well. Rochdale has already been referred to, and in addition Mr Gatty has been very successful in his hunt for specimens at Lakenheath, near Cambridge. Analogous "finds" have been made besides at Sevenoaks, Sittingbourne, and Wandsworth, as well as at Namur in Belgium, and in certain parts of France. In every case the specimens have conformed to the various distinct types.

The significance of these pigmy flint implements it is hard to define. That they are *complete* implements is established beyond a doubt; but that they point to the existence of a pigmy race (though the specially remarked absence—except at Lakenheath—of other and larger neolithic implements from their company seems to point to such a theory) is not proven. Granted, however, that a pigmy race (pigmies indeed, since some of the Scunthorpe specimens measure ony $\frac{3}{16}$th of an inch!) fashioned these implements, there arises the fascinating question as to whether these English, Belgian, French, and Indian colonies were branches of one race, or—owing to a migration—identical. In support of the former alternative may be quoted the adage that "a common want creates a common tool"; yet, as Mr Gatty (who is most non-committal, however) points out, if the truth of that old saw be accepted, how is it that so natural a desire as that of being able to shoot, presumably common to all early nations, should have resulted in the Scunthorpe pigmy inventing an arrowhead, while his Indian cousin's invention fell short of achieving such a weapon?

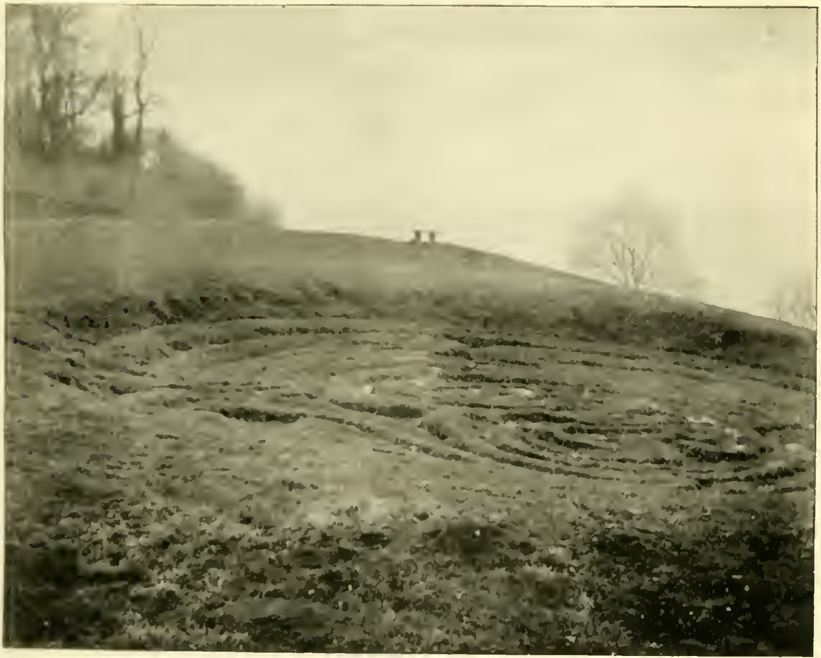
The matter, of course, is still *sub judice*, and likely to remain so for many years to come; and with the extraordinary visions conjured up by a possible migration of pigmies from India's coral strand to the chalk cliffs of Albion in the dark days of the Stone Age we must leave the subject.

Before altogether quitting Scunthorpe geologic, it may be of interest to record a few other local curiosities. Roman relics have not infrequently been found, the presence of the stern legions being further vouched for by the remains of an encampment at Alkborough, at the northern (Humber) extremity of the Cliff Hills. Mr Gatty, we believe, possesses a fine Roman fibula, and some Roman coins unearthed in the district. Proceeding backwards, we learn that a very fine spear-head, of the Bronze Age, now in the possession of Canon Greenwell, was taken from the peat,—according to the workman who found it,—though more probably it fell from the sand to the peat. In one of the Scunthorpe inns, however, is to be seen a veritable treasure from the peat—the skull and horns of *Bos primigenius*, whose bones have likewise therein been discovered.

Lastly, reference must be made to the "star stones" found in the Kill Well or Kell Well, a tiny little stream (reputed of petrifying qualities) that springs from the hillside about midway between Scunthorpe and Alkborough, and trickles down the cliff to the Trent below. These "star-stones," flat and five-pointed, are found in the bed of the stream, and were at one time held in great repute by local superstition. They are, indeed, supposed to be identical with the amulets of the Romans and other early inhabitants. To their frequency the present writer can testify, having plundered the stream of several in the



A BIRCH AND AN OAK GROWING TOGETHER.



Photos by A. E. Johnson.

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REMAINS OF THE "JULIAN BOWER" IN NORTH LINCOLNSHIRE.

course of an hour or so. Upon some of these expert opinion reports as follows:—

> The fossil is a part of the stalk or arm of a *pentacrinus* (consisting of a cup-shaped body with a crown of arms attached by a stalk), belonging to the *Pentacrinidæ*, a family of the Sea-Lilies or Crinoids. The whole stalk is either short or may reach a length of 60 feet in some species, and is composed of a series of ring-like or pentagonal joints. The whole group is Palæozoic, its greatest development being in the Silurian rocks. These particular ones are Jurassic, ranging from the Trias to the present day.

In view of which august statement it will be wiser, perhaps, to add nothing upon the "star-stone's" magical properties!

It had been intended to conclude this paper with some discursive remarks upon the archæology of the district under consideration. But the demands of space leave room only—after giving a bare mention of the antique church at Alkborough, which tradition assigns to the remorseful murderers of Thomas à Becket—to refer to the remains of the "Julian Bower," likewise at Alkborough, and said to be one of the only three similar antiquities in the kingdom. A photograph of this "bower" accompanies this article, from which the reader will see that the remains consist merely of the foundations—cut in the cliff soil — of a maze. Not a stone of the walls is left standing, and speculation as to the purpose served by the original building is speculation only. That the "maze" could have been designed for amusement the nature of its arrangement and its small limits hardly lead one to suppose. One theory makes it an exercise-ground for monks, though on what grounds we cannot say: certainly such wearisome exercise as it would furnish accords but ill with traditional notions as to the well-fed ease of the early monastic fathers. Its date is likewise a mystery, though probably subsequent to the Roman encampment already referred to, which lies but a stone's-throw away, commanding a magnificent view of the great waterways of Trent and Ouse where they meet to form the Humber, and of which the main features (though disguised as a modern pleasaunce) are plainly discernible.

Ichneumons.

By Claude Morley, F.E.S., &c.

Amongst the handsomest and most interesting insects which will force themselves upon your observation during a country stroll in any of the summer months are the parasitic flies known as Ichneumons. They are so abundant that to drag the sweep-net over the herbage, or to swing the butterfly-net through the air on any windless day, is to capture several of them; and when one contemplates that each of these organisms has attained maturity at the expense of another's life, one is led to wonder wherein this life is better or more beneficial than that which has been sacrificed to its birth. "There is nothing fixed in Nature;" yet is her stability great! Though the course of evolution is constantly progressing, the progress must be for the benefit of Nature as a whole at the expense of any particular group. The caterpillars of the majority of insects are extremely injurious to the vegetable kingdom: they not only defoliate the trees and shrubs, demolish the herbage to its roots, and ruin our food-stuffs, but the very inner wood of great trees and the roots of the plants are attacked by certain kinds. Were these ravishers to have full sway we should very quickly have, for instance, no cabbages for dinner, no corn for our bread, no flowers for our vases, and, above all, the landscape would be devoid of the lovely leaves, grasses, and plants that are now so pleasing and restful to the eye, presenting but a sere and barren waste. That so great a calamity does not occur any day is due to the pertinacity of the caterpillars' enemies, among which none is more fell than the Ichneumon, whose duty it is to search out the pests in their own proper retreats and there to slay them, not swiftly and directly, but slowly and insidiously, though none the less surely.

An egg is inserted by the Ichneumon beneath or upon the caterpillar's skin, which, when hatched into a footless grub, begins to assimilate to its own body the juices stored in the adipose tissues of the caterpillar's body. Vital organs are by instinct avoided, since the destruction of these would be also fatal to the parasite in its earlier stages: those parts which go to sustain the caterpillar during its pupal existence are gradually sapped, and it is not till, or till just before, it becomes a chrysalis that the host is destroyed, for then the grub, finding itself full-fed, has no further need of its living pabulum. Within the dead pupa-case the parasite spins for itself a silken cocoon, and, when you are looking for the moth's emergence, issues forth in full perfection of wing and leg to perpetuate its good work in the balance of Nature. The intruder does not, however, always have it all its own way, for in many instances there are what are known as hyperparasites: these are species which prey upon the parasites, and are sometimes very closely related with them. In one instance I have found even the hyperparasite destroyed by yet another entomophagous grub, so that, in this case, the poor caterpillar was actually carrying about three living grubs, each within the other, in her own body! How much farther the process may be carried I cannot conceive, but enough has been said, I think, to prove that "There are more things in heaven and earth, Horatio, . . ."

The economy of the Ichneumonidæ is more or less analogous in every case; and every schoolboy who essays to breed Currant Moths has expressed disgust in more or less forcible terms at the appearance of *Ichneumon trilineatus*. Some kinds lay but a single egg in each caterpillar, some lay several; the host's pupa is often used as a protection for their own, but many kinds construct free cocoons, which, in certain cases, are attached for safety to a twig by a long and slender filament, while others are buried in the ground or in moss. What will strike the observer is the extreme similarity of the grubs of every species, pointing to a low state of specialisation, which to a lesser extent is perpetuated in the imagines.

And here we come to the real difficulty connected with these insects—their maddening family likeness. So great is this that the merest lay mind knows an Ichneumon when he sees one, but only a specialist can tell to what species it belongs. In the days of the old entomologists — Ray, Linnæus, Forster, Fabricius, &c.—before this *impasse* was realised, there was no lack of students of this family, but since Gravenhorst exhibited in 1829 the great number of species that were then known to exist, their microscopic distinctions, and the innumerable errors into which the first nomenclators had fallen, entomologists have become extremely chary of tackling so intricate and enravelled a skein. Consequently but few works, compared with those upon other insects, have appeared, and these are fraught with deep thought and minute discrimination: in Britain at the present time there exists *no reference* to which one may turn for enlightenment upon this subject, which was partly and incomprehensively treated of by Stephens in 1835, and superficially commenced, though never completed, by Bridgman and Fitch in 1880.

To turn, however, from their many intricacies to the ease with which quite a large collection of Ichneumons may be compiled, we find them exhibiting an almost human love of this world's sweets. They are often found upon the "sugar" placed for the delectation of moths on tree-trunks at night, and during the daytime umbelliferous and other flower-heads often teem with yellow-, red-, blue-, and white-marked specimens of these pretty insects. Some kinds prey upon aquatic larvæ, possess the power of running, like Gerris and certain species of Stenus, upon the water, and may often be swept from reeds and sedges. Some are attracted by artificial light during the hours of darkness; and others pass the winter in the perfect state among moss, fallen leaves, and at the roots of grass. Species which prey upon caterpillars living deep in the solid wood of trees are provided with very long ovipositors with which to reach their victims, and are said to bore with them through the hardest wood; species which attack fully-exposed larvæ have a very short ovipositor, hardly visible beyond their body. The old theory, presupposing that each parasite was restricted to a particular host, is now exploded by the breeding of many different kinds from a single one; and we may take it that the only restrictions to be ascribed to parental instinct are those of the adaptability of the host to sustain the Ichneumon grub till it shall have attained maturity.

A Naturalist's Ramble in South China.

By J. C. Kershaw, F.E.S.

Day is just breaking, and already the bulbuls are chattering and squabbling in the bushes and bamboos, whilst the air, after the stifling hot night, feels quite chilly, and the country seen in the hazy uncertain light looks picturesque and inviting enough. But the July sun quickly changes all this, and under his fierce rays the long sweeps of burnt-up frowsy grass and the naked, arid hills give little promise of much animal life. But we find later that this is not altogether the case.

Most of Kwangtung and some of Kwangsi provinces are granite country, mostly disintegrated near the surface, but with boulders of solid rock, which have withstood the weather, scattered over the hills and plains, some of the hills being a mass of piled-up rock, lumps of white quartz gleaming here and there on the bare red earth. In places the hills are seamed and cut into by deep and narrow ravines, often 30 feet or more deep and only 3 or 4 feet wide, the sides sometimes clothed with a kind of bracken and polypody and other ferns and shrubs.

Some ranges are sparsely wooded with dwarf firs, but the greater part are utterly barren, except sometimes for coarse grass and fern. Truly, the Chinese have ruined and disafforested their country, cutting and lopping the trees for firewood. Indeed, little vegetation escapes the native, and as we walk on we meet several small parties of women and children armed with roughly-made knives or choppers, and bamboo rakes, with which they rake up leaves and grass and hack and chop the bushes and undergrowth, till the only wonder is that any plant survives at all.

Over these hills, which range from a few hundred to over 2000 feet in height, sail numbers of the black kite (*Milvus melanoides*), well known to Britishers in China under the name of "Bromley" kites.

The first part of our ramble lies along what is called a road out here, and we wonder which is worse,—the part paved with long rough granite slabs, or the path alongside deep in sand: not a tree within miles, only here and there a patch of pandanus and prickly pear and the inevitable horseshoe-shaped grave. These latter disfigure the country all over, as fowls and dogs spoil a garden with scratching. Farther on we pass one of the usual style of wayside joss-houses, with a fairly large banyan in front and a little scrubby growth at the back. These joss places seem to have preserved almost the only large trees that are left, except the little bit of wood at the back of the villages, amongst which may be found a few fine old banyans; most of these, too, are joss trees, with the customary little pots, jugs, and joss-sticks beneath them, the trunks bedaubed with red papers.

Our route now lies through a valley bright with patches of vivid green padi, just sown, other fields being in process of reaping and ploughing. The path is only a narrow strip about a foot wide, with mud-and-water on either side, whilst the heat is great over these rice-fields; but we are free from mosquitos, which avoid the sun. Now and again we disturb a white Heron (all species of herons are known to foreigners here as padi-birds or storks), and over one field some swifts (*Cypselus pacificus*) are flying unusually low. These paths through the rice-fields are favourite places for snakes to bask, but nearly all are small and harmless species.

We are nearing a big walled village: its pawn-shops, the tall rectangular buildings seen in the sketch, have been visible a long time. These pawn-shops or storehouses are the places where the coolie class deposit their winter clothing during the summer, and are favourite objects of attack to bands of native robbers. A drove of small Chinese cattle and water-buffaloes passes with a small boy in charge, and it is interesting to see how little notice the former animals take of strangers, and how the buffaloes stare and start aside and sniff the air, seeming much inclined to charge, as indeed they sometimes will.

Here we rest in the shade of an old banyan near a gate in the village wall, and buy some green "coolie" oranges from a fruit-stall, which are better than asking for water,

A WALLED VILLAGE

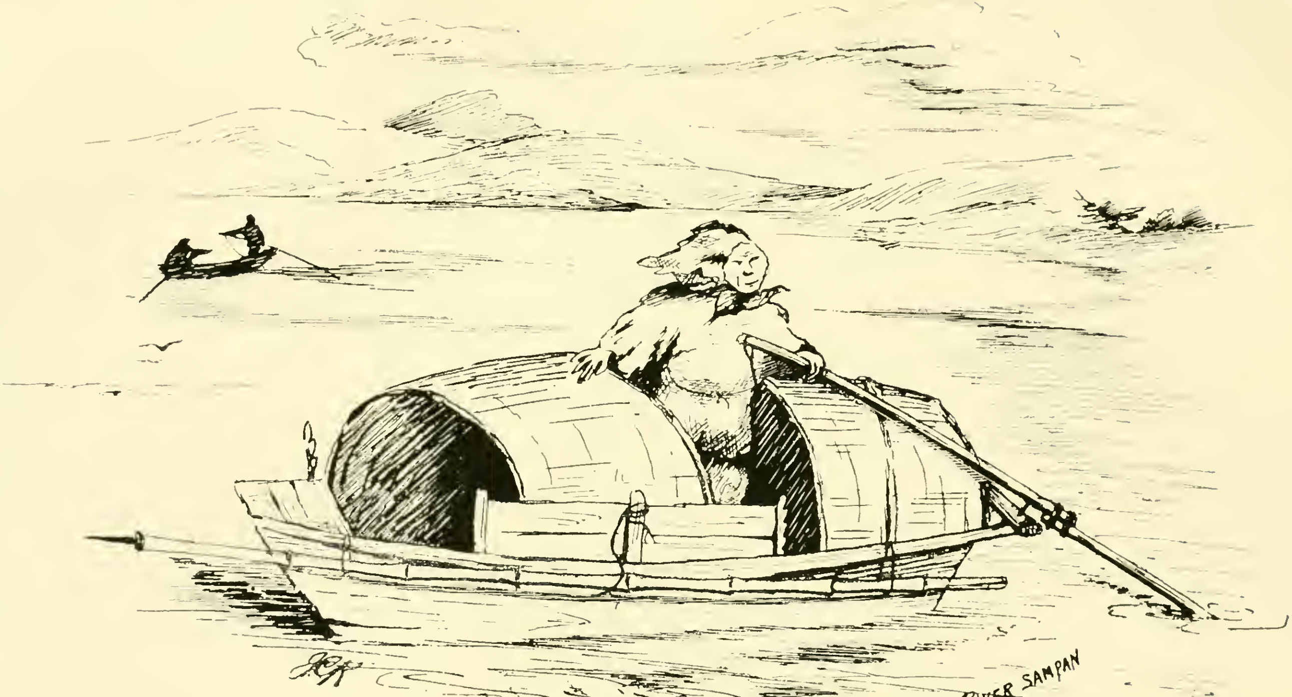
as this would be brought in a dirty jar from a very doubtful well. These fruit-stalls and their owners are generally dirty and look forbidding, but fruit with a thick skin to peel is safe enough. The proprietor has a tame mynah (*Acridotheres cristatellus*), which hops about the stall and does not add to its cleanliness. These birds and a grackle (*Graculipica nigricollis*) are very common here throughout the year. The usual crowd of children and loafers come up to stare at the "quanchai" (I write phonetically) or foreign devils. Some boys, with a long bamboo daubed at the end with a sort of birdlime, are catching the big cicadas which are shrilling overhead in the tree, putting their captures in a bird-cage. These insects are hung up in little cages to sing, the Chinese holding their vocal powers in great estimation, and most Europeans would prefer them to native music.

The chief bird life of the barren hills and plains is magpies (the European one), and, during the winter, Richard's pipit, which seems to delight in the most desolate and arid ground. The butterflies which haunt the same localities are chiefly of the genus Precis, three species—*P. orithyia*, *P. almana*, and *P. atlites*—being very common. Occasionally a crow (*Corvus torquatus*) flies slowly over, cawing hoarsely. This bird appears to be the only representative here of the true crows. Amongst the wet padi-fields, and in the scant bits of wood far removed from water, we find two lovely kingfishers common, *Halcyon atricapilla* and *H. smyrnensis*. When away from water they are usually pouncing down on grasshoppers and locusts. In the runnels by the padi-fields a man is fishing with a net for the edible frog and small fish of sorts. One of the scaly ant-eaters or pangolins is found amongst the hills here, but is not common, and, being chiefly nocturnal, is seldom seen.

Arrived at our destination, a fairly thick piece of wood with a village in front (the Chinese say they must have trees round a village, or the ants would destroy all the timber in the houses), we find the mosquitos troublesome, the blue-and-black-barred species. Butterflies are also plentiful, and one flowering tree simply swarms with Euplœas and Danainæ and several species of Papilio. Two

China robins (*Copsychus saularis*) are snarling at each other, the hen meanwhile calmly hopping on the sward at the edge of the trees, picking up food, and in her movements and carriage reminding one at once of the redbreast at home. They are one of the commonest birds here, typically Eastern, whilst its multiplicity of popular names shows how well it is known to foreigners in China—Peking robin, Dayal-bird, Magpie robin in allusion to its plumage, and by the Portuguese the Dominico. It is much kept by the natives as a cage-bird, and has the same cock of the tail and sideways head movements, besides the pugnacity, of the English robin. It sings well too. From a thick bush comes a sound of some birds quarrelling and fighting for all they are worth, like the jabbering of sampan-women: it is only the jay-thrushes (*Dryonastes perspicillatus*) amusing themselves as they play a sort of follow-my-leader through the trees. Little flocks of white-eyes (*Zosterops simplex*) go through the bushes like titmice, while all the time the bulbuls keep up a chattering overhead. There are three species here, two of them noisy and ubiquitous, one of which has the only bright colour about it on the under tail coverts, which are vermilion and show up conspicuously.

The loud cries and strange behaviour of three or four Schach shrikes attract our attention, and on examining the bush where they are demonstrating, we find a rather large snake in the top of it, the shrikes taking no notice of us, but flying within a few inches of the snake's head. A clod of earth dislodges the snake, and the birds follow him off. This shrike (*Lanius schach*) is a very irritating bird, which usually selects a high spray or stake or other commanding position, whereon he sits bolt upright, and when one is stalking some particular bird he at once sounds the alarm in a harsh voice, but does not offer to move from his post, thus adding insult to injury. Though only about 10 inches long, he is a courageous bird, and, if wounded, will bite and scratch to the finish. He sings very sweetly too sometimes, with, however, intermittent harsh notes. On a stilingia-tree and the seedlings beneath we find a colony of larvæ of the large Atlas moth (*Attacus atlas*), regarded as a great rarity by most people here. Certainly the imago is not often seen



A WEST RIVER SAMPAN

on the wing, and, if captured, is pretty sure to be in a tattered condition, but they are very easily bred. A native "sportsman" comes up to see our bag, his own consisting of a Koel-bird (*Endynamis honorata*), the common pigeon here (*Turtur chinensis*), and a bulbul, or the wings of one, as he is shooting with an old Martini rifle, and shows us a box full of roughly rolled up pellets made from sheet-lead. Each bird has a large hole drilled through it. They will be used for chow, of course, and so would a kite if he shot one.

But the sun is low in the west now, and we begin our journey homewards, passing a piece of level ground where the soldiers of the local mandarin have been practising with bows and arrows, notwithstanding some of them are armed with ancient Martinis. A Drongo or king-crow (*Buchanga atra*) is now using the target as a convenient perch to hawk from. We miss the note of one bird, a cuckoo (*Cacomantis merulinus*), which sings incessantly day and night in early spring and summer. This is the Rain-, Brain-fever-, or Widow-bird, as it is variously termed by Europeans. It has a mournful whistle of three or four long notes and three short ones, which it utters from some tree, in which it will remain a long time if undisturbed. But they have migrated now.

A thunderstorm is threatening in the distance, and as our way lies by one of the numerous creeks leading from the West River to the sea, we take a sampan. The crew consists of two women and some children, one of which is tied on its mother's back whilst she rows with an oar on one side, the other woman sculling with an oar at the stern. This lop-sided fashion is the usual custom here, and we crawl along till we round a bend of the creek, when a mast is shipped and a sail hoisted—the latter consisting of part of a pair of trousers, ditto coat, and the rest flour-bags of some American firm, with the name conspicuously printed on them. Yellow and brown dragonflies swarm over the water; the Chinese call them "tai-foong" flies, literally big wind, and they are supposed to presage a typhoon by their flight. One of the large pied kingfishers (*Ceryle varius*), nearly allied to the European black-and-white species, is hovering in the air like a kestrel; then it suddenly drops a yard or two, hovers again, takes a circling flight, another hover, and it plunges for a moment in the water, afterwards making off to the stakes of a fishing-net. The Portuguese call this bird Guarda rio, River-watcher; and the Smyrna kingfisher they term Rei de camaram, King of the shrimpers. The bats are flying in hundreds now, and a lighted candle is stuck in the little joss-house in the stern of the boat, hung with tawdry bits of red and gilt paper, and containing the ordinary bedaubed clay figures of various gods.

At the landing-place there is a crowd of sampans, and the regular howling, shouting, and cursing ensues as we edge our way in. The boat-people only ask double their proper fare as they know us well, and are well contented with half what they ask, whilst we are glad to get home just before the storm breaks and the rain comes down in torrents.

Symbiosis.

By E. M. Wood.

Now that the spring is with us once more the student of nature rejoices, not only in the renewed greenness of the earth, in the outspreading of young leaves, or in the appearance of the first flowers of the year, but in the fact that those problems of the life and growth of the plant-world, with which he has become familiar through the medium of text-books, are coming once more into play; and that he may for himself watch the outward and visible signs of the hidden processes working in their appointed seasons: in a word, theories may become practice and individual experiences.

Of the mighty and wonderful doings of nature, the social side of plant-life is not the least absorbing. As human beings and the lower animals live in communities or colonies, dependent upon one another for mutual help in the struggle for existence, so also we may see the same thing among animals and plants, between plants and plants,—those of a similar class associating together,—or again, different species in the vegetable world combining together for some mutual advantage.

Ecology treats of plants in the broadest sense of this benefit association, such as the gathering and living together of plants inhabiting the same element or position—according to moisture, heat, cold, &c.—necessary for their well-being, as hydrophytes or lithophytes. But the more intimate relations of individuals may more properly be termed Symbiosis.

Referring to the large subject of the advantages which animals and plants share with one another, it is only necessary to quote two instances: that of many flowering-plants which secrete honey, and attract insects of many kinds, who, in return for the nectar, unconsciously distribute pollen from one flower to another, rendering the production of fertile seeds possible. Or another, perhaps less commonly known instance, that of certain marine green algæ which inhabit sea-anemones; the green parts of the alga having the property of breaking up carbonic acid gas and liberating the oxygen which is necessary to the breathing operations of the animal. On the other hand, the plant absorbs the carbonic acid breathed out by the animal, illustrating the ancient saying that "a good exchange is no robbery."

Phanerogams, or flowering-plants, may be associated with other flowering-plants, or with cryptogams, in much the same way; also cryptogams with lower orders of vegetation, those which reproduce their kind by spores and not seeds, or by the simpler methods of buds breaking off from the original plant and producing new ones.

In all cases of symbiosis among plants, be it noticed, there is on one side a plant containing an abundance of chlorophyll, and on the other an organism which has none or a very small quantity. The obtaining of a food-supply is the chief reason for these co-operative associations. Chlorophyll, as every one knows, is the green colouring matter distributed in the body of the plant in minute corpuscles called chloroplasts. Chlorophyll is only developed in these chloroplasts in parts of the plant exposed to light. Their use is to help in the process of the formation of carbohydrates (starch, sugar, &c.) from raw material under the direct influence of sunlight. This process is now termed "photosynthesis," hitherto called "assimilation of carbon."

The mistletoe, that historic plant of mystic rites, is one which plays a part in one of these partnerships. It is a partial parasite—that is to say, that although it grows upon a host-plant, from whom it derives a certain amount of sustenance, it has green leaves of its own, and is therefore able to make use of the CO_2 in the atmosphere. Mistletoe grows upon various trees, such as apple, elm, or poplar, and sends into the soft cortical layer of the branch upon which it has established itself, its suckers or haustoria, and grows fat upon the elaborated food which the host-plant intends for its own use. Whilst the tree is enjoying its brief summer, and working to provide against the days when, shorn of its leaves, it takes an enforced rest, the parasite is flourishing exceedingly and performing its own private functions of flowering and producing fruit. But when the tree is resting, the mistletoe, on account of its evergreen leaves, is making good its shortened supply of food by manufacturing some on its own account. Therefore scientists advance the theory that the parasite is now a useful companion to the tree, supplying a certain quantity of elaborated food during this time to the host-plant. On the other hand, may we not also surmise that the mistletoe, having "short commons," does all it can to supply the deficiency in its own larder, and that very little, if any, food is returned to the tree? So that it is a matter of opinion whether this is a case of parasitism or of partial symbiosis! It is pretty certain that the mistletoe is not so distinctly parasitic as to kill the trees upon which it grows. The quality of the apples is possibly not improved, and this may account for the increased cultivation of the mistletoe in some districts, where it is considered of greater commercial value than the apples themselves.

It is said that a partnership exists between certain flowering-plants and a fungus mycelium which invests their roots,—the hairlike threads of the fungus, interwoven with roots, underground of course, providing the phanerogam with water and food-stuffs from the earth, whilst it receives for these services various organic materials produced in the green leaves of the flowering-plant. It is also a fact that certain water-plants harbour in cavities of their stems and leaves minute algæ, but it does not seem quite clear what advantage the larger plant reaps from its small lodger, who evidently gets house-room without rent!

The relations between two cryptogamic plants associated for mutual benefit is well exhibited by the complex plants we call Lichens. Lichens are among the first vegetation to appear upon the surface of rocks and stones, and find a footing where more highly organised plants would perish. They are seen clinging to rocks, walls, palings, and trees in a great variety of shapes and colours. Some are mere layers of flattened thallus like the yellow Parmelia, others form a wavy thallus or become much branched like the reindeer moss or the so-called cup-mosses of our shady banks and commons. The Lichen consists of a distinct fungus and an alga, one destitute of chlorophyll and forming the principal structure of the plant-body, performing the processes of reproduction and absorption; the other possessing chlorophyll, even if disguised by other pigments, and capable of the food-manufacture necessary for the composite organism. A real and helpful partnership is, therefore, carried on. The fungal portion is closely allied to the Ascomycetes, a section of Fungi to which the Pezizas belong; the algal portion is composed, in different lichens, of a variety of genera—Pleurococcus, Nostoc, &c.

There are two methods by which the whole colony may be reproduced—a purely vegetative method and a more complex (supposed) sexual process. In the first way minute particles of the lichen, looking like powdery dust, are given off from the surface of the thallus or branches: these consist of one or more algal cells enclosed in a web of fungus-hyphæ or threads, and are capable of developing, under suitable conditions, into new plants. The other process is said to be due to sexual fertilisation. There are to be found on a mature lichen flat or depressed bodies, called apothecia; these bear on their concave surface a layer of cells filled with flask-shaped organs, which when ripe and moist give off, on the pressure of surrounding turgid cells, minute spores. At the same time some algal cells are forced out on to the surface of the apothecium, so that some, at least, of the fungal spores find at once, on germination, the necessary companion for their well-being. The apothecia are supposed to be the result of the union of certain differentiated hyphal threads in the body of the lichen.

Thus does the social life among the plant-world work smoothly on, each one performing just what is expected of it, no more and no less, else would the little colonies soon come to grief.

Lists of Summer Migrants.

By W. Percival Westell, M.B.O.U.

I. *Where our Summer Migrants spend the Winter.*

1. Blackcap	Northern Africa and Southern Europe.
2. Chiffchaff	Shores of the Mediterranean.
3. Corncrake	Algeria, Egypt, Asia Minor, and Palestine.
4. Spotted Crake	Africa and India.
5. Cuckoo	Central Africa and Southern India.
6. Stone-Curlew	Temperate Europe, Northern Africa, and South-Western Asia.
7. Turtle-Dove	Northern Africa, Egypt, and Nubia.
8. Hobby Falcon	Africa and India.
9. Pied Flycatcher	Africa.
10. Spotted Flycatcher	"
11. House-Martin	South of Abyssinia.
12. Sand-Martin	India, Africa.
13. Nightingale	Africa.
14. Nightjar	India and Africa.
15. Ring-Ousel	Northern and Central Africa, and Asia Minor.
16. Tree-Pipit	Africa, Persia, and India.
17. Kentish Plover	Africa, India, and Southern China.
18. Quail	Inhabits the Palearctic region and whole of Africa, and migrates from Northern Europe during winter.
19. Redstart	Northern Africa.
20. Common Sandpiper	Africa.
21. Red-backed Shrike	"
22. Swallow	Ethiopia and India.
23. Swift	Africa.
24. Yellow Wagtail	"

25. Garden-Warbler	Africa.
26. Grasshopper Warbler	Northern Africa and Southern Europe.
27. Marsh-Warbler	Africa.
28. Reed-Warbler	"
29. Sedge-Warbler	Northern Africa and Asia Minor.
30. Willow-Warbler	Africa and Persia.
31. Wood-Warbler	" "
32. Wheatear	Western and Northern Africa to Persia and Northern India.
33. Whinchat	Northern Africa.
34. Greater Whitethroat	Southern Africa.
35. Lesser "	Africa generally.
36. Wryneck	China and Northern Africa.

II. *A List of Summer Migrants to the British Isles, ranged somewhat in the order in which they generally appear.*

1. Spotted Crake	March.
2. Ring-Ousel	End of March, or beginning of April.
3. Wheatear	End of March.
4. Stone-Curlew	March, April, and early in May.
5. Chiffchaff	End of March, rarely later than first week in April.
6. Yellow Wagtail	End of March, or early in April.
7. Sand-Martin	Early in April, generally before the Swallow or House-Martin.
8. Swallow	Middle of April.
9. House-Martin	About April 20th, *usually* a little later than the Swallow.
10. Redstart	Beginning to middle of April.
11. Grasshopper Warbler	Middle of April.
12. Whinchat	From middle to end of April, sometimes as late as May.
13. Blackcap	Middle of April.
14. Nightingale	Middle of April; males arrive about ten days before the females.
15. Hobby Falcon	Appears in April.
16. Wryneck	First or second week in April, generally a few days before the Cuckoo.
17. Cuckoo	"In April come he will."
18. Tree-Pipit	Middle of April.
19. Common Sandpiper	" "
20. Lesser Whitethroat	About middle of April, sometimes earlier.
21. Greater "	About middle to end of April.
22. Willow-Warbler	Second week in April.
23. Kentish Plover	April or May.
24. Corncrake	Last week in April.
25. Red-backed Shrike	End of April, beginning of May.
26. Sedge-Warbler	Latter part of April.
27. Garden-Warbler	End of April, or early in May.
28. Reed-Warbler	" "
29. Wood-Warbler	" "

30. Turtle-Dove	Latter part of April.
31. Quail	During May.
32. Swift	Early in May; one of the latest to arrive and the earliest to depart.
33. Marsh-Warbler.	About middle of May.
34. Spotted Flycatcher	7th to 20th of May.
35. Pied Flycatcher	May.
36. Nightjar	About the middle to end of May.

III. *The following List shows the earliest dates of arrival of Summer Migrants during* 1901, *as recorded by my correspondents.*

Blackcap	April 10	Somerset, Clevedon.
Chiffchaff	March 30	Suffolk, Elveden.
Corncrake	April 21	Staffordshire, Stoke-on-Trent.
Cuckoo	" 7	Cumberland, Kirkoswald.
"	" 7	Essex, Colchester.
"	" 7	Kent, Bidborough.
Stone-Curlew	" 9	Suffolk, Elveden.
Turtle-Dove	" 19	Worcestershire, Redditch.
Spotted Flycatcher	" 25	Staffordshire, Longton.
House-Martin	" 14	Kent, Canterbury.
Sand-Martin	March 31	Berkshire, Reading.
Nightingale	April 5	Essex, Stanford-le-Hope.
"	" 5	Kent, Dartford.
Nightjar	" 23	Somerset, Wrington.
Ring-Ousel	March 17	Sussex, Lewes.
Tree-Pipit	April 9	Surrey, Upper Tooting.
Redstart	" 9	" "
Common Sandpiper	" 15	Northamptonshire, Northampton.
" "	" 15	Shropshire, Ludlow.
Red-backed Shrike	May 8	Worcestershire, Redditch.
Swallow	March 31	Hampshire, Fordinbridge.
Swift	April 19	Worcestershire, Redditch.
Yellow Wagtail	March 20	Mid-Lothian, Pentland Hills.
Garden-Warbler	" 23	Northamptonshire, Northampton.
" "	" 23	Sussex, Burwash.
Grasshopper Warbler	April 19	Somerset, Clevedon.
Reed-Warbler	May 2	Sussex, Lewes.
Sedge-Warbler	" 9	Oxford, Bicester.
Willow-Warbler	March 6	Berkshire, Crowthorne.
Wood-Warbler	April 14	Hertfordshire, St Albans.
Wheatear	March 17	Sussex, Lewes.
Whinchat	April 20	Surrey, Upper Tooting.
Greater Whitethroat	" 8	Sussex, St Leonards.
Lesser "	" 10	Somerset, Clevedon.
Wryneck	" 1	Essex, Dedham.
"	" 1	Hertfordshire, St Albans.

I have purposely dealt only with those summer migrants which regularly visit us *and nest* with us.

Archæology.

S. MICHAEL'S CHURCH, GARWAY, HEREFORDSHIRE.—II.

By Rev. P. J. Oliver Minos, Ph.D., M.R.A.S. (Lond.)

I do not understand Mr Micklethwaite's description of the carvings on the four capitals, therefore I will venture to describe them briefly for my readers. On the outer capital to the left (1) is carved the lotus with ferns and ball ornament, and on the inner capital (2) is carved a curious capped head[1] with set pearls issuing from the mouth. On the outer capital to the right (3) is carved the lotus leaf and flower, and on the inner capital (4) are carved curious bundles of twigs, &c. These carvings are certainly symbolical; and symbolical ornaments came into Europe with the Crusaders. Therefore the Templar architect (and perhaps the workman) intended the said carvings to be tongues in stones. Let me (as far as I am able) interpret them. On the left (1) lotus stands for life in the East; (2) is a fine representation of a common Eastern saying—viz., "a good man's words are like strings of pearls." Our Lord used a similar expression (and His hearers understood it) when He said, "Neither cast ye your pearls," &c. (S. Matt. vii. 6. Compare Job xxviii. 18). On the right (3) the lotus again appears, but in a different form from (1), and it may be said to refer to life utilised; (4) the bundles of twigs, &c., represent good and evil of this mortal life. In connection with the last there is a striking passage in the Bible: "The soul of my lord shall be bound in the bundle of life with the Lord thy God" (1 Sam. xxv. 29).

Not far from the west door, and on the left, stands the font. This font is (late) Norman, because its surface shows unmistakably the marks of the Norman diagonal-tooling (see F. N. Q., vol. i. No. 4; "Norman Architecture," III.) It consists of two blocks of stones—one for the bowl, one for the pillar and base—of hard dark sandstone. It was once covered with thick lime-wash, traces of which are still to be seen. The bowl is octagonal on the outside and circular in the inside, with a margin of 6 inches at the angles; and it is borne on a short thick pillar (16 inches high, 70 inches thick) with roll mouldings and narrow footing. The total height is about 37 inches. Judging from the bowl's inside diameter (27 inches) and depth (11 inches), it must be inferred that the font was intended for immersion, although there is sufficient evidence to show that the churchyard living water or spring (called The Well) was used for administering the rite of baptism. At the angular margins are to be seen cross pattee (eight in number) incised and painted blue (renewed). This form of the cross appears to be a particular favourite of the Templars, and they symbolise (like the Greek cross) catholicity and equality. On the 4-inch rim of the octagonal exterior of the bowl are twenty-four equilateral triangles (three on each side) painted red (renewed). Of course the equilateral triangles symbolise the Holy Trinity; but in this special case it represents the baptismal formula, "In the Name of the Father, and of the Son, and of the Holy Ghost." Below the triangles, on the west front of the font (where the priest usually stands at baptism), there is a carved panel[1] (7 inches long by 5½) showing a Latin cross bruising the serpent's head. This well-known design represents the victory of the cross, or it may illustrate "manfully to fight under the banner against sin, the world, and the devil." Strictly, the latter is represented in Christian iconography by the *manicor* or *manicore*—*i.e.*, a hybrid animal, with a human head and a globular body ending in a serpent's tail. I think the said panel ought to have had the Sacred Dove, as the eight sides of the font represent the Holy Ghost and His seven gifts. Lastly, Garway Church font was a (superstitious or) locked font: the lead used to fasten the staples for the lock is still to be seen. In ancient days mothers were wont to place their babes suffering from convulsions, croup, whooping-cough, &c., in the font, fully believing that healing would take place; but, as mishaps will happen, the healing in some cases resulted in death—either from suffocation or neglect. To prevent such mishaps a Constitution of Edmund, Archbishop of Canterbury, 1236, first required that every font should be covered and locked. The ancient cover is lost; but a modern flat wooden cover, octagonal in shape (perhaps the original shape), takes its place.

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[1] "In the eleventh century it appears in the form of a low cap, with ornamental band round the forehead, and a depression in the middle which produces two blunt horns at the sides. There is a good representation of this form in the MS. Cott. Nero, b. iv. f. 34, which has been engraved by Strutt, Shaw, and Dr Rock."—Dr Cutt's 'Dict. of the Church of England,' p. 407.

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[1] I think this panel and other ornaments on the font are of later date (probably fourteenth century), because they cut across the Norman diagonal tool-marks.

Standing at or near the font, and looking in front right and left, one is sure to notice the cumbersome oak benches in the nave. At first sight they appear to be ungainly and uninteresting, but on closer examination you will detect interesting marks of the adze at the curves of the *finals*. Further, you will observe that the benches are raised from the floor on oak blocks 6 inches high, and without these blocks the seats are only 12 inches (instead of the usual 18 inches) high—too low to sit upon comfortably; moreover, the (what are now) book-rests at the backs of the benches are only 17 inches (instead of the usual 22 inches) high. These measurements suggest that the benches were not originally used only for sitting purposes: they were *prie dieux*—*i.e.*, the Templars being soldiers observed the standing posture during worship, and only bent their knees on the shelves at the backs of the benches before them, and rested their bodies on the seats behind them. In Eastern churches the nave is still without chairs or benches, and the congregation still stand or kneel during public service. Isaiah had said, "That unto Me every knee shall bow, every tongue shall swear." Also St Paul had said, "As I live, saith the Lord, every knee shall bow to Me, and every tongue shall confess to God." (Compare Philip. ii. 10; Ephes. iii. 14.) The workmanship of the said benches is very rude and unfinished, suggesting amateur workmen. Who but the Templars themselves could have been working at these benches? It was a strict rule of the Templars never to be idle, therefore it may be their work at odd moments.

Advancing towards the chancel arch from the west end, one sees the doorway to the rood-loft. This rood-loft canted over the nave, and afforded space for a narrow gallery along the top: the place where the rood-beam rested can yet be seen. Access to this gallery was by a winding stair (blocked up) in the body of the S. wall; the later steps were built on the N. side of the choir *crossing* a low-side window. (The low-side window was once sheltered by a lean-to, as evidenced by the chamfered string-course still embedded on the exterior of the N. chancel wall. I think this low-side window was used for hearing confessions, and not for the use of lepers or the excommunicated.) There seems to have been an altar under the rood-gallery, judging from unequal levels and the remains of projecting masonry on the N. end of the chancel arch under the rood-entrance. There is a stoup[1] on the N. wall of the choir and near the communion-rails. This unusual situation of the stoup is explained by the N. stone bench (recently covered over with oak board) and the stone stairs[2] to the rood-gallery—*i.e.*, those Templars who entered the chancel through the chapel of the Order, and did not officiate, either sat down on the stone bench or went up the stairs: these must pass the said stoup on the right, and would dip their right hand into the stoup and make the sign of the cross (as is the custom) on their foreheads.

From the choir we proceed to the sanctuary. The east wall contains, high up, three small and singular windows: the outer ones are round-headed, with deep splays; the central one is formed of two slightly pointed heads with a *rosace* or quatrefoil. On the N. wall are two long narrow windows (lancet)—one inside the communion-rails and one outside. These are the only ones of the kind in the whole church. The communion-table has the pre-Reformation altar-stone top on oak stand and under oak board; the altar-stone exhibits the well-known five crosses representing the five wounds of our Lord. On the N. side a fine Jacobean oak stall, and on the S. side the Preceptor's[3] oak chair, are to be seen. On the floor (not in their original positions) are two (Templars') tomb-slabs[1]—one carved with a cross flory, and the other with a plain Latin cross (and chalice on it); but both are on three steps to mark the three grades in the Order—viz., Knights, Priests,[2] and Serving Brethren. The communion-rails are of old oak reel pattern. Here let me point out that these rails are not in their original positions, as marks or cuttings are seen at the ends, telling the observer that they were parts of other similar rails now used for the reading-desks. These may have possibly formed the railings about "the table," which, according to the Communion Rubrick, "shall stand in the body of the church." The oak table-top in the tower may have been "the table," as it plainly indicates a very carefully finished and bound-up-at-the-ends piece of work, now fixed to very rude round legs. The said oak top undoubtedly did not belong to the legs, nor was it always attached to them. The table-top as a whole was portable, and probably rested on trestles.

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[1] Another broken stoup is at the W. end, to the *left* of the door.

[2] The later date of the said bench and stairs is proved by the insertion into them of portions of the Templars' tomb slabs with cross flory.

[3] Philip de Mewes was the last Preceptor of the Templars at Garway. His signature immediately follows that of Thomas de la More, the last Master of the Temple, London, in the noble profession of faith, and pathetic appeal to the justice and pity of the papal inquisitors and bishops of London and Chichester on the 20th April 1310 (see 'Archæologia,' vol. xxxi. pp. 182-197).

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[1] Besides these there are seven other tomb-slabs (whole or part), with cross flory, scattered about in the church, chapel, or tower. Those with cross flory (I presume) were tomb-slabs of knights; but the one with a plain Latin cross (and chalice on it) would be the tomb-slab of a priest of the Order.

[2] "The bull of Pope Alexander, 'Omne datum optimum,' allowed them to admit within their fraternity as many honest and godly clerks and priests as they conscientiously required. These were to be subject to no person, power, or other authority, except their own chapter; but to pay perfect obedience in all matters and upon all occasions only to the Grand Master at Jerusalem, as their master and bishop. Like other monastic establishments, they obtained from pious and charitable people all the advowsons within their reach, and frequently retained the tithe and glebe in their own hands, deputing a priest of the Order to perform divine service and administer the sacraments."—'Archæologia,' vol. xxxi.

Richard de Swinfield (Swynfeild), Bishop of Hereford, was at Garway in 1288-1289, not as the bishop of the diocese on an episcopal visitation. See Register Ric. de Swynfeild, Ep. Hereford, f. lxiv, a. Garway was extra-diocesan even under the Hospitallers, for they resisted the visitation of Richard Mayhew, or Mayo, Bishop of Hereford, in the early part of the sixteenth century. Moreover, Garway Church claimed the privilege of Sanctuary: several papal bulls sternly forbade any one laying hands either upon the persons or property of those flying for refuge to Templars' churches. The Rev. M. G. Watkins wrote, "It is on record that the Prior of Monmouth took refuge in the basement" of the church tower.

British Field Zoology.

By various Writers.

CHAPTER II.—THE PROTOZOA.

By H. E. FORREST.

Pond-hunting—Implements—Ovum—A cell—Amœba—Where found and how—How to examine—Locomotion—Functions of Relation—Functions of Nutrition—Functions of Reproduction—No specialisation of function—Absence of sexes—Rejuvenescence—Contractile vacuole—Nucleus—Plant and animal—The resting-stage—Cyst—Diffusion in air.

HAVING carefully studied the various aspects from which any animal can be described, we are now in a position to commence the observation of the simplest forms of life. Fortunately these forms are to be found in abundance, without much trouble or the need of complicated apparatus for capturing or preserving them, so that every field naturalist has equal opportunities for their study. The one necessity is a microscope, and this instrument is now manufactured in such cheap form, and at the same time quite good and reliable for field work, that no one interested need be without one. The worker should also make a point of roughly sketching in a note-book what is seen under the microscope, and so get into the way of doing this habitually. It is of the greatest assistance in remembering what is seen, and is also a permanent record available for other purposes.

Pond-hunting.—No better introduction to Field Zoology could be found than the study of the creatures inhabiting our ponds and ditches. Here are to be seen representatives of almost all the great classes of the Animal Kingdom, from the lowly Amœba (protozoon) to the Frog (vertebrate metazoon). The study of "Pond-life" has this further advantage, that wherever the student may reside, no difficulty will be experienced in getting any quantity of material to work upon. A microscope with two objectives—1-inch and ¼-inch—will be required, but beyond this the equipment for collecting is a very modest one :—

1. A walking-stick.
2. A small muslin net to fix on to end.
3. A small wide-mouthed bottle to fix on to end.
4. A few bottles and test-tubes.
5. A small drag, with long string.

I have found a combination of 2 and 3 most useful, made by cutting off the bag of the net and tying the edge of the muslin round the neck of the bottle (fig. 1). The water filters through the muslin, leaving a concentrated mass of creatures in the collecting-bottle. This is then emptied into another bottle, when the former is again ready for use. The drag, No. 5, is made by bending two pieces of stout iron wire as in fig. 2, then tying them together at right angles to one another, with a piece of lead wrapped round the shanks (fig. 3). The drag is very useful for drawing to the side water-weeds which are beyond reach of the stick.

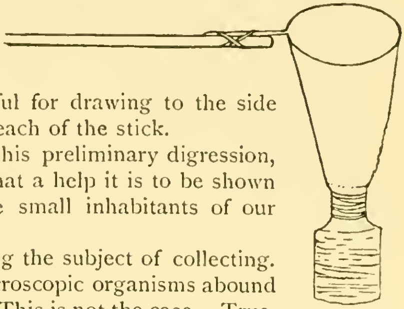

Fig. 1.

I trust the Editor will allow this preliminary digression, since I know from experience what a help it is to be shown how to set about collecting the small inhabitants of our ponds and ditches.

One word more before leaving the subject of collecting. There is a prevalent idea that microscopic organisms abound chiefly in dirty or putrid water. This is not the case. True, certain forms of life abound in such places, but the most productive ditches and ponds are those in which the water is clear, with a plentiful growth of green weeds, algæ, &c. The greatest *variety* is to be met with in ponds which have a little stream flowing through them. The reason is obvious.

"*Omni vivum ex ovo*"—"Every living thing comes from an egg," wrote Harvey. This axiom takes us back to the beginning of every animal—when it existed merely as a tiny speck of organic matter. The word "ovum," usually translated egg, is used here in the restricted scientific sense. As applied to the higher animals it means the minute cell formed in the ovary of the female which, after fertilisation, subdivides—becoming first a mass of cells, and then, by a more or less complicated series of changes, a separate individual like the parent.

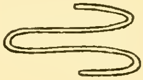

Fig. 2.

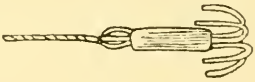

Fig. 3.

In our introductory chapter (F. N. Q., vol. ii. p. 69) we stated that "the simplest forms of life will be studied first—the one-celled animals—then the more complex." This is, indeed, the only way in which the student can hope to attain to a clear idea of that unity of plan which runs through the whole animal world. It may seem a startling assertion to make, but it is nevertheless perfectly true, that at the very first origin—the ovum—*all animals are one-celled.* The Protozoa remain one-celled throughout life. The Metazoa—*i.e.*, all animals higher in the scale than protozoa—cease to be one-celled as soon as the ovum begins to develop. In the higher forms their cellular character is not discernible except in the early stages of development.

It would be beyond the province of this paper to pursue further the fascinating study of embryology, but enough has been said to show how important it is that we should have a clear idea as to

WHAT IS A CELL?

Briefly, a cell might be defined as

THE UNIT OF ORGANIC LIFE.

Each cell consists usually of three portions—

1. An outer covering, or *cell-wall*, enclosing
2. A mass of living matter, *protoplasm* (fig. 4 *b*), which again contains a more solid portion,
3. The *nucleus* (fig. 4 *c*).

Having settled these preliminaries, our best course will be next to take an example. The simplest, and for many reasons the best, example is Amœba—a creature which is adopted in all biological text-books as a type of a unicellular organism. It is, however, an imperfect *cell*, as it has no cell-wall.

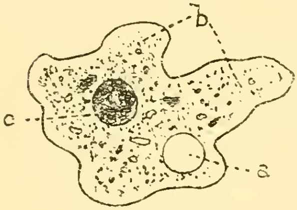

Fig. 4.—*Amœba*.

a Contractile vacuole.
b Protoplasm.
c Nucleus.

A certain cookery-book, when treating of the proper procedure in preparing a hare for the table, gives this sage advice, "First catch your hare, then," &c. Echo now cries, "First catch your Amœba, then put him in the microscope." But how? I well remember, as a youth, reading eagerly through the description of Amœba in a certain text-book, and going forth to the nearest pond determined to catch one of these wonderful beasts and carry it home captive. The book said it was a bit of brown jelly to be found crawling on the surface of the mud at the bottom of a pond. No idea was given as to size, and I expected to find a creeping thing as big as a mustard-seed, if not as large as a pea. I could see nothing resembling the pictures, but took some of the weeds home, and put a piece in the microscope. What is this snaky thing gliding across the field? Surely it must be the long-sought Amœba? Not a bit of it. I had captured my first *Hydra*. Obviously this was not the way to find Amœba, and it was many years later that I first made personal acquaintance with it. To the practical field zoologist who wants to find Amœba the best advice is to look for it in ditches, not in ponds. Choose a ditch which is undisturbed, and which contains clear water and growing weeds—duckweed, algæ, &c. In the summer when the sun shines the surface of the water will be covered with a thin scum consisting almost entirely of the microscopic algæ called diatoms. Take some of this scum and some of the floating weeds, and you are certain to find amongst the other organisms hundreds, perhaps thousands, of Amœbæ.

Place a few drops of this gathering on a glass slip and examine in the microscope with the 1-inch objective. Even now it is no easy matter to distinguish the amœbæ amongst the diatoms, infusoria, and flocculent vegetable matter, all of which are more conspicuous than our quarry. There are several species of Amœba, and they vary greatly both in size and activity. The large ones are generally the more actively moving; the smaller, sluggish. Under the 1-inch objective a large one will appear about ½ inch in diameter; a small one less than ¼ inch. The animal is colourless and formless. The substance is somewhat of the consistency of white of egg, and it is continually changing shape by flowing over itself, hence the name from ἀμοιβὸς = changing.

When an Amœba wishes to advance in any direction it pushes outwards a portion of its body-substance (protoplasm) as a blunt finger-like projection. The projection is called a pseudopodium (= false-foot), and the whole class to which the Amœba belongs is named Rhizopoda (= root-footed animals)). The more fluid inner portion of the body then flows into the advanced pseudopodium, which is thereby distended more and more till the whole body-substance has left its original position and now occupies the position taken up by the advanced pseudopodium. In this way the Amœba performs one of its functions of relation—locomotion. Put into few words, we may say that in this simple animal locomotion is effected by the entire body flowing along from point to point (fig. 5).

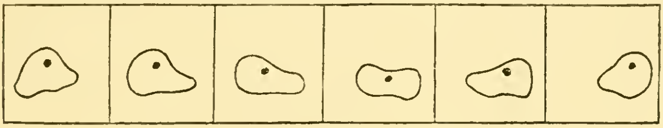

Fig. 5.

In the higher animals we recognise as functions of relation the phenomena associated with the sense-perceptions—sight, taste, touch, smell, and hearing, and these we know to be performed by special sense-organs—branches of the nervous system. It is hardly necessary to point out that in the Protozoa—as unicellular organisms—there is no nervous system. Nevertheless it is impossible to watch an Amœba for any length of time without perceiving that it is possessed of sensibility, for (1) it avoids obstacles in its course, and (2) it selects its food. We can only surmise that the protoplasm of the body is possessed of a kind of diffused sensibility enabling it to perceive its relations to its environment.

Just as the plan of locomotion adopted by Amœba is the simplest imaginable, so also is its method of feeding—the function of nutrition.

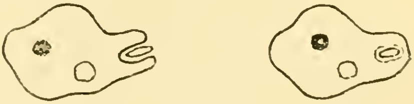

Fig. 6.

When the animal comes across a particle of organic matter suitable for food it puts out two pseudopodia—one on each side (fig. 6). These lengthen until they meet on the opposite side and coalesce, when the body closes over the food. A small quantity of water is swallowed with the food, which at first appears to be surrounded by a ring of clear fluid,—the rest of the protoplasm always appears granular,—but the water quickly diffuses itself, when the clear ring vanishes.

The function of reproduction is also the simplest imaginable. The Amœba feeds, and grows. Then the animal just divides itself into two, each half walking away a separate and complete Amœba! This is repeated *ad infinitum.*

Glancing back over the above paragraphs, we see that the three functions of Relation, Nutrition, and Reproduction are all performed by one and the same parts of the Amœba—the body-substance, or protoplasm. We do not find one portion set apart to act as a mouth, another as a vent, another as a foot, another as an ovary, &c. There is, in short, a complete absence of *specialisation*—any part will perform any function. In the course of this series of papers on Field Zoology we shall have other types of animals described, and shall see how, as we rise higher and higher in the scale, each group is more and more specialised, and not only are special organs set apart for particular functions, but special individuals are set apart each with its own particular organs, whilst another set of individuals have other organs, the complement of the first,—we call them male and female.

Amongst the Protozoa we have no certain indication of sex. Very rarely, conjugation and fusion of two individuals have been observed, and this has been interpreted as a kind of sexual reproduction. I have seen this in some of the higher infusoria (Stylonichia, *e.g.*), but not in Amœba. Yet, though we cannot detect any indication of sex, this occasional conjugation of two individuals has a significance of the greatest interest in relation to certain phenomena of reproduction in the higher animals. Amongst these latter it is notorious that interbreeding between near relatives, if continued for several generations without the introduction of "new blood," leads to deterioration in the physique of the race, and, not uncommonly, to eventual extinction. Public attention has recently been called to an instance in the case of the wild cattle at Chartley Park.

In the same way it has been found that the Protozoa will multiply by fission at an almost incredible rate as long as food is abundant, but that eventually, *unless conjugation takes place between individuals which are not near relatives*, the race deteriorates and dies out. This was proved by a long series of careful experiments by a French scientist, M. Maupas, who isolated an infusorian and observed its generations for a period of five months. By that time there had been 215 generations produced by division, and since these lowly organisms do not conjugate with near relatives there had been no fusion of two individuals. The result was that the family had exhausted itself. They were not old exactly, but were being born old. Self-division came to a standstill and the power of nutrition was lost. Meanwhile several individuals which had been removed to another basin conjugated with unrelated ones of the same species. One of these was isolated and watched for five months. The usual richness of successive generations was observed down to the 180th, when the strange sight was seen of individuals of the same family attempting to conjugate with one another. The results, however, were *nil*, and the conjugates did not even recover from the effects of their forlorn-hope. [See 'The Evolution of Sex,' by Geddes and Thompson, p. 165.] It will be seen from the above that in all animals the race deteriorates and "grows old" unless its "rejuvenescence" is brought about by the introduction of new life by the actual fusion of the protoplasm of two cells (entire individuals in Protozoa—sex-cells in Metazoa), and that the best results follow when the cells are not nearly related.

Before quitting the subject of Amœba we must mention a feature which it has in common with all Protozoa, but which is found nowhere else in the animal kingdom—the contractile vacuole (fig. 4 *a*). This is a certain space in the body which is seen to slowly fill with clear fluid (water?) until it appears a globe within the animal, when it suddenly collapses and vanishes as though it had been pricked with a pin. It again slowly fills and again collapses, repeating the process at regular intervals. Various opinions have been advanced as to the function of the contractile vacuole: some have thought that it might be an excretory organ, analogous to the kidney; others that it is a primitive sort of heart, propelling water through the body.

We mentioned earlier in this chapter, when defining the cell, that every cell has a denser body in the substance of the protoplasm, called the nucleus. The shape of the nucleus varies greatly, especially amongst the Protozoa, but in Amœba it is globular or ovoid. It has been found that whenever cell division takes place, the nucleus always divides first, and this fact has a peculiar significance in the sexual reproduction of higher animals—a subject beyond our present province.

Cells which are identical in most respects with Amœba are found throughout the animal kingdom. They occur in certain parts of all sponges: the corpuscles in the colourless blood of insects and crustaceans are amœboid, and so are the colourless corpuscles found amongst the red corpuscles in the blood of vertebrate animals. The corpuscles of lymph are amœboid, as also are the ova of mammals, &c., in their very earliest unicellular stage. In one respect only do these differ in structure from the typical Amœba—they have no contractile vacuole. The amœboid cells of sponges, however, *have* a contractile vacuole, which seems to indicate an affinity to the Protozoa.

In speaking of the Amœba's method of feeding we mentioned incidentally that the food consisted of *organic* matter, and this illustrates a striking physiological difference between animals and plants—viz., that the former can assimilate only animal or vegetable matter, but the latter are able to combine inorganic matter into organic compounds. The only exceptions to this rule are Fungi, and some insect-eating plants, which in this respect behave as animals.

Amœba, like other living organisms, requires a period of rest. On the approach of winter or a droughty season the animal ceases to display any vital activity and becomes enclosed in a leathery envelope or "cyst." It is said then to be "encysted," and can remain so for an indefinite time. The contents of the cyst in most Protozoa break up into several individuals, which eventually issue forth from a rupture in the envelope. In this way the species is preserved from one season to another. The cysts are very small and light, so that when dry they are taken up by any breath of wind and so diffused far and wide. At all seasons there must be millions of these organisms floating in the air and settling everywhere, ready to come into being whenever and wherever the conditions are favourable.

The name "Infusoria" was applied originally to the minute beings which were found swarming in infusions of hay, &c. It was thought that the decayed organic matter actually generated these tiny creatures, but the real source of their presence was the air acting as a carrier. It is known now that the air conveys not only Infusoria and Rotifers, but spores of mosses, ferns, fungi, algæ, and the microbes or germs of many of the diseases which attack man and animals.

We have dealt at length with the structure and physiology of Amœba as a typical Protozoan, and this course was adopted in order to gain a clear idea of the general principles which govern a simple organism in its three aspects of Relation, Nutrition, and Reproduction. In our next chapter we intend taking a few other Protozoic forms in an ascending scale, and showing how the simple Amœba type is modified in each case, whilst the essential elements of the cell remain the same.

(*To be continued in our next.*)

Record of Species Observed.

Species.	Common Name.	Locality.	Date.	Observer.
Dibolia cynoglossi	New British Beetle	Pevensey	Aug. 1902	H. Donisthorpe
Dryocætes autographus	Wood-boring Beetle	Near Edinburgh	June "	Prof. Beare
Malachius marginellus	Malacoderm Beetle	Peebles	July "	J. E. Black
Stylopyga decorata	New British Cockroach	Worksop	March "	Eland Shaw
Panchlora exoleta	" "	Coalville, Leicester	June "	"
Leucania albipuncta	White-point Wainscot	South Devon	Sept. "	G. T. Porritt
Plusia moneta[1]	New Plusia Moth	Middlesex	May "	H. Rowland-Brown
Harpalus neglectus	Geodephagous Beetle	Southport	June "	G. W. Chaster
Nephanes titan	Tiny Beetle	"	" "	"
Orthochætes setiger	Spiny Weevil	"	Aug. "	"
Bledius bicornis	Short-sheathed Beetle	Luccombe Chine	May 1899	Willoughby Ellis
Tropideres hilaris	Imported Beetle	London shop	1902	E. A. Newbery
Labidura riparia	Local Cockroach	Hampshire	"	Major Robertson
Vanessa antiopa	Camberwell Beauty	Near Chichester	Sept. 1902	J. Alderson
Bacotia sepium	Small Moth	Chingford	May "	L. B. Prout
Cerura bicuspis	Alder Kitten Moth	Tilgate Forest	" "	J. C. Dollman
Lophopteryx carmelita	Scarce Prominent Moth	Near Galashiels	April "	J. C. Haggart
Oncodes gibbosus	Spider-eating Fly	New Forest	July 1900	Rev. H. S. Gorham

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[1] This insect, quite recently found to inhabit Britain, is now taken in some numbers on the Kent side to London: two collectors one day took ninety chrysalids each and left many more.—C. M.

Species.	Common Name.	Locality.	Date.	Observer.
Triænodes conspersa	Waterfly	Near Seaton, Devon	Aug. 1902	Robert M'Lachlan
Ischnura pumilio	Small Dragonfly	New Forest	June "	G. T. Porritt
Limotettix stactogala	New British Frog-hopper	Pagham, Sussex	Aug. 1901	J. Edwards
Ceratophyllus Garei	New British Flea	Tring	July 1902	Hon. N. Rothschild
Hydaticus seminiger	Rare Water Beetle	Esher	1902	S. W. Kemp
Psammotis pulveralis	Small Moth	Isle of Purbeck	"	E. R. Bankes
Diastictus vulneratus	New British Beetle	Brandon, Suffolk	June 1902	Claude Morley
Xanthia ocellaris	Uncommon Moth	Ipswich	Sept. 1898	E. C. Bedwell
Lestes Dryas	Dragonfly	Near Grantham	July 1902	Rev. A. Thornley
Formica sanguinea	Very rare Ant	Wellington College	Sept. "	W. Barnes
Odynerus reniformis	Rare Wasp	Colchester	July "	B. S. Harwood
Stenostola ferrea	Longicorn Beetle	Barmouth	May "	J. K. Taylor
Metallites marginatus	Rare Weevil	Henley-on-Thames	April "	Canon Fowler
Ctenophora flaveslata	Rare Dipteron	New Forest	1902	H. Ashby
Gynandrophthalma affinis	New British Beetle	Near Witney, Oxford	June 1899	Canon Fowler
Crinopteryx familiella	Small Moth	Imported	Oct. 1902	T. A. Chapman
Nephopteryx similella	New British Moth	New Forest	June 1901	C. G. Barrett
Odynerus simillimus	New British Wasp	Colchester	1901 *et* 1902	Edward Saunders
Psectra diptera	Rare Waterfly	Near Dumfries	July 1902	B. M'Gowan
Leucania vitellina	Delicate Wainscot Moth	Bifrons, Canterbury	Oct. "	J. F. Green
Lathridius Bergrothi	Newly introduced Beetle	Chesham and Oxford	1902	.. ..
Orchestes iota	Local Weevil	Matley Bog	Aug. 1901	Claude Morley
Calocoris ticinensis	Local Hemipteron	" "	"	"
Acheta sylvestris	Wood Cricket	New Forest	"	"
Trigonometopus frontalis	Nasal Fly	Matley Bog	"	"
Lype phæopa	Waterfly	" "	"	"
Eurylabus rufipes	Rare Ichneumon	" "	"	"
Gymnusa variegata	Local Beetle	Near Peebles	Aug. 1902	Prof. Beare
Zeugophora flavicollis	Rare Plant Beetle	Epping Forest	"	S. W. Kemp
Asemum striatum	Northern Longicorn	New Forest	June 1902	H. J. Thouless
Sitaris muralis	Rare Heteromeron	Chobham	Aug. "	D. S. Robertson
Aporia cratægi	Black-veined White	Weymouth	1863-64	W. F. Johnson
Psocus 4-maculatus	Local Neuropteron	Saltash	July 1896	G. C. Bignell
Kermes quercus	New British Coccid.	Wimbledon and Sherwood	May and July	R. Newstead
Œdemera virescens	New British Beetle	Central Norfolk	June 1884	J. Edwards
Spilodes sticticalis	Pyralid Moth	Scotland	" 1901	C. G. Barrett
Botys terrealis	" "	"	..	"
Leucania l-album	White-l Wainscot Moth	South Devon	Oct. 1901	E. R. Bankes
Halictus lævigatus	Small Bee	East Kent	Sept. 1902	A. J. Chitty
Meloë rugosus	Rare Oil Beetle	Broadstairs	Dec. "	Rev. T. Wood
Eremocoris podagricus	Local Heteropteron	Surrey Downs	..	F. B. Jennings
Clunio marinus	Marine Gnat	Guernsey and Jersey	August	Rev. E. N. Bloomfield
Ceratopsylla ægyptius	New Egyptian Flea	Cairo	Jan. 1901	Hon. N. C. Rothschild
Hesperia alveus, Hübn.	New British Butterfly	Cawston, Norfolk	..	James Edwards
Hemianax ephippiger	African Dragonfly	In Devonport	Feb. 1903	Robert M'Lachlan
Vanessa antiopa	Camberwell Beauty	Putney Heath	Sept. 1902	G. B. Longstaff
Micromus angulatus	Neuropteron	Colvend, Kirkcudbrightshire	Aug. "	K. J. Morton
Amblyteles flavocinctus	Rare Ichneumon Fly	Glanvilles Wootton	..	C. W. Dale
Lathridius Bergrothi	Recently-found Brit. Beetle	Wells and Southampton	..	Joy and Gorham
Soronia elongata	New Clavicorn Beetle	Sea of Marmora	April 1902	Malcolm Cameron
Abdera triguttata	Heteromerous Beetle	Newtonmore, N.B.	Sept. "	J. E. Black
Sesia asiliformis	Yellow-legged Clear-wing Moth	South Devon	Aug. "	E. A. Rogers
Hydrilla palustris	Marsh Moth	Lincolnshire coast	June "	J. F. Musham
Trochilium crabroniforme	Hornet Clear-wing of the Osier	Luffness, N.B.	July 1898	W. Evans
Corixa præusta	Water-boatman	Bolton	1902	O. Wittaker
Ceratophyllus londinensis	A new Mouse Flea	London	May 1900	Hon. N. C. Rothschild
Aphodius tessulatus	Manure Beetle	Arthur's Seat	Feb. 1903	Prof. Beare
Rhizophagus dispar	Clavicorn Beetle	Dalmeny Park	Jan. "	"
Agathidium nigripenne	Wood-louse Beetle	Peebles	June 1902	J. E. Black
Pselaphus dresdenensis	Small Beetle	Newton Regny Moss	Aug. "	F. H. Day

Species.	Common Name.	Locality.	Date.	Observer.
Evæstethetus ruficapillus	Short-sheathed Beetle	Newton Regny Moss	Aug. 1902	F. H. Day
Gyrinus minutus	Whirligig Beetle	" "	"	"
Erirhinus validirostris	Local Weevil	Brantham, Suffolk	Feb. 1903	Claude Morley
Phæogenes infimis	New British Ichneumon	Bentley Woods, "	March 1903	"
Chilosia flavicornis	Early Hoverer Fly	" "	"	"
Pimpla diluta	Rare Ichneumon	" "	"	"
Encephalus complicans	Ball Brechelytron	Bentley, "	"	"
Cymindis axillaris	Coast Beetle	Foxhall Plateau, "	April 1903	"
				'Zoologist'—
Cymochorea leucorrhoa	Fork-tailed Petrel	Somersetshire	Nov. 30, 1902	R. H. Read
Box vulgaris	Bogue Fish	Cromer, Norfolk	Dec. 1902	T. Southwell
Haliaëtus albicilla	White-tailed Eagle	Ipswich	Feb. 9	J. G. Tuck
				'Field'—
Pisces	Rare Fish (various)	At Cardiff	..	J. J. Neale
P. hyperboreus	Red-necked Phalarope	Breeding in Ireland	..	R. L.
T. varius	White's Thrush	Yorkshire	Dec. 18, 1902	J. Cunningham
Felis Catus	Wild Cat	Sutherlandshire	Dec. 1902	I. E. H.
Lixus paraplexicus	Reed Beetle	Stalham	Aug. "	W. Eldred
Sphinx pinastri	Pine Hawk-moth	Middlesborough	1900	T. A. Lofthouse
Sphinx convolvuli	Colvolvulus Hawk-moth	Near Selby, Yorks	1901	W. Hewett
				'Naturalist,' Feb. 1903—
Miccotrogus picirostris	Weevil	Gelt Woods	July 1902	J. Murray
Bembidium femoratum	Beetle	Petteril	April 12, 1902 Oct. 11, "	"
Chrysomela fastuosa	"	Gelt Woods	May 10, "	"
Podabrus alpinus	"	Near Wreay	June 7, "	"
Prasocuris aucta	"	Orton	June 14, "	"
Telephorus figuratus	"	"	" "	"
Dasytes plumbeo-niger	"	"	" "	"
Ægialia sabuleti	"	Near Gilsland	July 2, "	"
Homalota currax	"	Gelt	Aug. 9, "	"
Tachyusa umbratica	"	"	" "	"
Melanoththalma fuscula	"	Petteril	Oct. 11, "	"
				'Naturalist,' March 1903—
Cymatophora flavicornis	Yellow-horned Moth	Cleveland	April 1902	T. A. Lofthouse
Hypsipetes ruberata	Ruddy Highflyer Moth	"	..	"
Cucullia chamomillæ	Chamomile Shark Moth	"	May 31, 1902	"
Larentia filigrammaria	Autumnal Moth	"	..	"
Cheimatobia boreata	Northern Winter Moth	"	Nov. 1902	"
Harelda glacialis [1]	Long-tailed Duck	Chichester	First week in Feb. 1903	Rev. Dr Arnold
Bernicla brenta [2]	Brent Goose	Emsworth, Hants	During Jan. 1903	"
Merops philippinus [3]	Blue-tailed Bee-Eater	Parkstone, Dorset	Sept. 1902	Mrs Butt
Ranunculus ficaria [4]	Lesser Celandine	Lodsworth	Jan 8, 1903	Rev. E. O. Edgell
Botaurus stellaris	Bittern	Fishbourne	Feb. 1903	Rev. Dr Arnold
" "	"	"	Jan. 1860	"
" "	"	Ashling	" 1881	"
" "	"	Fishbourne	1891	"
" "	"	Earnley	"	"
" "	"	Westbourne	Feb. 1892	"
Sula bassana	Gannet	West Wittering	" 28, 1903	Rev. G. C. Walpole
Otis tetrax	Little Bustard	St Peter's, Isle of Thanet	" 1903	'West Sussex Gazette'

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[1] Several immature birds seen about this date.

[2] In unusual evidence here at this date.

[3] Believed to be second authentic occurrence of this species in Great Britain.

[4] Does not usually appear until middle of February at earliest.

Species.	Common Name.	Locality.	Date.	Observer.
Grapta C-album [1]	Comma Butterfly	Bognor	Feb. 20, 1903	Mr H. L. F. Guermonprez
Mustela putorius [2]	Polecat	Ely, Cambs	Dec. 1902	Recorded by Rev. E. T. Daubeny
Picus Martius	Black Woodpecker	Lyndhurst Road Station, Hants	Spring 1887	" "
Turdus varius	White's Thrush	Torquay	Nov. 1901 and Nov. 1902	Mr F. B. Doveton
Yunx torquilla	Wryneck	Uppingham	Feb. 24, 1903	L. R. Fawcus
Ampelis garrulus	Waxwing	"	March 8, 1898	Rev. W. J. Constable
Muscicapa atricapilla	Pied Flycatcher	Ridlington	May 22, 1892	H. Walker
" "	"	Exton	" 1899	Lord Gainsborough
Loxia curvirostra	Crossbill	Uppingham	Oct. 25, 1899	C. E. Raven
Athene noctua	Little Owl (nest 2 young)	Stockerston	June 5, 1902	C. R. Haines
Haliaëtus albicilla	White-tailed Eagle	Exton	Feb. 3, 1891	W. Whittington
Falco subbuteo	Hobby	Greetham	" 22, 1901	H. Masters
Falco Æsalon	Merlin	Exton	March 21, 1901	"
Pandion Haliaëtus	Osprey	Burley	April 2, 1884	R. Tryon
Sula bassana	Gannet	Luffenham	Nov. 5, 1898	'Field'
Fuligula ferina	Pochard (nest 7 eggs)	Saddrington, Northhants	May 19, 1902	W. J. Horn
Tetrao Tetrix	Grey Hen	Greetham	Sept. 24, 1896	E. Hanbury
Porphyrio Smaragdonotus	Green-backed Gallinule	Lyddington	March 5, 1898	.. ..
Totanus calidris	Redshank	Seaton	June 4, 1901	C. R. Haines
Motacilla melanope	Grey Wagtail	Normanton	" 1902	C. E. G. Dixon
Plusia bractea	Gold Spangle	Doncaster	Aug. 15, 1902	H. H. Corbett
Pogonocherus bidentatus	.. ..	Near Doncaster	March 5, 1903	"
Ocypus similis	.. ..	" "	1902	"
Testacella scutellum	Mollusc	N. Lincolnshire	Dec. 17, 1902	'Naturalist,' April 1903—J. W. Taylor

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[1] Very rare in Sussex.

[2] Two, out of four seen, killed and sent to a naturalist at Market Weston, Thetford.

The Field Naturalist's Library.

REVIEWS OF BOOKS, PERIODICALS, ETC.

A BOOK OF BEASTS AND BIRDS. By Gambier Bolton, F.Z.S. London: George Newnes, Ltd. Price 5s.

In this handsomely got-up book Mr Gambier Bolton has utilised a very large number of his splendid photographs as centres round which to write about many curious beasts and birds, and the result is an eminently readable volume which also pleases the eye. The book is here and there scientific and here and there otherwise, and sometimes a curious mixture. Our author opens with a sentence which leads us to expect that he intends to be severely accurate in his terminology, or at any rate gives the impression that he considers others should be so. He says, "One so often hears the words 'animal,' 'beast,' and 'mammal' jumbled together and used indiscriminately, that it is worth while to note briefly the differences in their meanings. Whilst the word 'animal' is applied to any 'organised being endowed with sensation and power of voluntary motion,' including, of course, man, beasts, birds, reptiles, fishes, and insects, the word 'beast' is applied to four-footed, or rather four-limbed, animals only, as distinguished from man, birds, reptiles, &c., and the word 'mammal' is confined to those animals which suckle their young." Now, without in any way subscribing to the definition of an animal which is here chosen,—for many invertebrates are fixed in position,—one would naturally expect the author to use the word "animal" in the sense which he himself indicates. However, on p. 127, referring to the long neck of the giraffe, he says, "It has only exactly the same number of bones in it that the neck of a man or any other animal has—viz., seven." Here the word "animal" is obviously "used indiscriminately" in the sense of "mammal" by the writer; nor do we think there is any great harm in that,—in a popular book,—were it not that such usage is expressly disparaged in the beginning. It is this curious mixture of exactitude and slackness of expression which we consider the greatest fault in the book. One other feature has somewhat detracted from the pleasure of reading the book —and it is a pleasure in spite of the faults—namely, the inclusion of so many sentences in quotation marks without any indication of the source from which they are taken.

Mr Gambier Bolton has—wisely, we think, for the purposes of this work — dealt chiefly with the curiosities of animal life, — zoological puzzles, as he terms them in one chapter,—which give him the opportunity of explaining many things that animal lovers often ask about. The explanations of these puzzles are generally sound, and this is one of the most interesting sections. The most amusing chapter is that in which the author describes his experiments on a number of animals in the Zoo with various musical instruments, amongst which he employed the bagpipes. The results of the different sounds on various animals are most entertainingly described, and the experiment must have provided the author with a most enjoyable afternoon.

An excellent chapter, too, is that on Some Four-handed Folk, in which Mr Bolton tells of his successful efforts to obtain the photos of the hanuman monkeys, and the habits of these animals in their native haunts. Amongst the other rarities of bird and beast life the curious New Zealand running birds find a place, the photos of the apteryx being particularly good, as also is one of a moa skeleton—that immense extinct bird which the Maories used to slaughter in numbers, probably for food at their gatherings, as numbers of skeletons have been found in one spot quite recently.

We must not omit to mention the excellent account of the animals of the late Queen as well as those of his Majesty. The royal family are all great lovers of birds and beasts, and our author tells us much of interest concerning their favourites.

The book is well worth the price, if only for the illustrations; but it is, in addition, very readable, and contains much information gathered from many sources in many climes.

TREES AND SHRUBS FOR ENGLISH GARDENS. By E. T. Cook. London: George Newnes, Ltd. Price 12s. 6d.

This volume is one of the "Country Life" Library, a name which to English readers is synonymous with wealth and profusion of illustrations of high artistic value, excellence of paper, type, and appearance, together with certainty of a letterpress from well-qualified authority. The book before us comes up to all this, and is indeed a magnificent tribute to the beauty of English gardens and woods. We have never seen in any one volume such a beautiful series of photographs of indigenous and other trees and shrubs reproduced in such excellent taste. It is the wish of the author that the book may do something to make English gardens more beautiful and interesting, and that it may win many to see the better ways of planting; also that it may be the means of bringing forward the many trees and shrubs of rare charm that are generally unknown or unheeded. Mr Cook rightly deplores the sad want of variety amongst evergreens and deciduous shrubs in the average English garden, and proceeds to indicate in no uncertain manner how the lack is to be made good. The book is eminently practical in its teaching, and many of the illustrations show the results of the advice given in the text about pruning, planting, &c. For instance, Mr Cook condemns the erroneous doctrines, still largely taught and practised, concerning the propagating of Coniferæ, and asserts that it may be laid down as a law that species of Coniferæ should never be grafted, but raised from seed.

The plan of the work is to deal with the trees and shrubs suitable for the varying environments—woodland, sea-coast, rock-garden, water-side, and so forth; in addition to giving full instruction on such matters as planting, pruning, removal of large trees, care of old trees, grouping, and all the other practical work of arboriculture. It is a volume that will commend itself to all concerned, and prove a valuable guide as well as a handsome companion.

THE BOOK OF BRITISH FERNS. By Chas. T. Druery, F.L.S. London: George Newnes, Ltd. Price 3s. 6d. net.

This welcome and elegant little volume is compiled and edited by the president of the British Pteridological Society, Mr Druery. It is the result of a decision of that society in August 1899, and in no way supplants the work of Mr Lowe, which is a work of reference for classification or confirmation of rare species as well as common ones. This work meets the need of a list on purely selective lines, embracing only the pick, and rejecting all such faulty members as may not possess some sufficiently redeeming character in another direction. It is supplemented by a description of the various species, chapters on Culture, Propagation, Rockeries, Frames, Ferns for Shady Gardens, Ferns in Rooms, Fern-Hunting, Fern-Crossing and Hybridising, &c. It is framed on non-technical lines, and the popular nomenclature is adhered to, both of which features make the book suited to beginners as well as to advanced students. For those who care to dip deeper into the life-history of ferns the appendix contains some really good things. We may mention of these chapters those on Apospory in ferns, and that on

Weismann's theory of Heredity, the latter explained by Dr Stansfield in a way that is very helpful. The book is a very useful addition to the field naturalist's library. The illustrations are numerous and excellent.

Several reviews are unavoidably held over.

CONTEMPORARY NATURAL SCIENCE PERIODICALS.

We are very pleased to find from our correspondents that the plan in this column of drawing attention to the more important contributions to other journals, which was initiated in our last issue, is much appreciated. As we intended, it assists our readers to find articles on subjects in which they are specially interested, and it will be a permanent feature of the F. N. Q. in future. We regret that it is not quite complete, but that is only because there are a few natural science journals which at present are not sent to us.

The articles in KNOWLEDGE during the last quarter have been quite up to the high standard of that paper. Prominent amongst them are those by Mr R. Lydekker on A Giant Seal and A Giant Land-Tortoise. Mr Pycraft discusses Nature's Troubadours, the birds whose musical organs are somewhat out of the ordinary in the results given forth. In the February issue Mr Fowler began a discussion on the Chemistry of the Stars, Mr Collier wrote on Cross-Fertilisation in Sociology, while in March Mr Lloyd Praeger in his article on British Wild Flowers has some interesting details on the climbing of brambles. Mr Williams is of decided opinion that the red-necked phalarope has bred for some years in the west of Ireland, the exact locality being wisely withheld from publication. There is still room for much ornithological work in Ireland. The April issue contains other attractive papers.

It is somewhat unusual to find BLACKWOOD'S MAGAZINE containing articles on outdoor nature topics, but both the March and April issues have an article by Ernest Robinson, the former on the Sussex Downs, the latter on the Nesting Season. Both are excellently written and are sure to be appreciated.

That excellent publication the AMERICAN NATURALIST contains in its January issue an article on the Water Snakes of Southern Michigan, by H. L. Clark. The subject is of course a very special one, but those who are interested in the variations in snakes due to age and sex should read this paper. In the same number Dr Shufeldt writes on the Classification of certain Groups of Birds, and E. Berry on New Ephemerid Nymphs. In the February number the most important item is by E. C. Case on American Pelycosauria.

A most useful article to the field naturalist who wants to learn how to describe accurately the external characters of a bird will be found in the

AVICULTURAL MAGAZINE for March. It is by W. P. Pycraft. The plates accompanying this article are the most helpful things on this subject we have seen.

The most important contributions to the NATURALIST of late are Notes on Holderness Birds, by T. Petch (February); North Lancashire Botanical Notes in 1902, by S. Lister Petty (March); Mosses and Hepatics of Baugh Fell, by W. Ingram (March); West Yorkshire Botanical Notes, by L. Rotheray (April); Beavers in Yorkshire, by H. Speight (April); and Northern Mosses, by Rev. C. H. Binstead. There are other numerous papers of value and local interest.

NATURE STUDY for March and April contains articles on the Pine-bark Beetle by E. W. Swanton (illustrated), and on Meteorology, Geology, Mollusca, and Entomology, these latter being in the department of Nature Study Handbooks. We were under the impression that sheep became infected with the liver-fluke by eating grass upon which the parasite was encysted, rather than by swallowing the water-snail in which the earlier stages of the fluke are passed.

The ANIMALS' FRIEND for March contains an article entitled "Humble Helpers," by "E. C.," which deals with the part played by snakes in keeping the balance of nature. We are very glad to see the writer regretting the craze for killing our harmless reptiles. It is a pity that the article is spoilt by inaccuracies, such as the statement that "the viper does not carry with him a dose of poison powerful enough to kill a healthy man or even child." A reference to the literature of the subject would have prevented the error, which might have the effect of causing some persons to be very careless in handling the viper. "E. C." also states that "vipers have been frequently tamed, and in this condition never injure those whom they have learnt to trust." We have kept as many vipers as most people, and have never known one yet that became tame or amenable to kind treatment; on the contrary, they are most dangerously treacherous in captivity in our experience. The ring snake, on the other hand, becomes most sociable under similar conditions.

The NATURALIST'S LIBRARY GUIDE is a new quarterly magazine edited by Percival Westell, which is intended to bring under the notice of naturalists the publications of the quarter. These, both books and magazines, are reviewed. In fact the 'Guide' is precisely on the lines of the Library column in this journal, except that a column for exchanges is added. We wish it all success, but doubt whether there will be sufficient support for a natural science *review* pure and simple, without articles as well. The price is 6d.

Field Clubs and Societies.

We have received the Proceedings of the Liverpool Naturalists' Field Club for the year 1902, and note with pleasure the increased prosperity of this excellent society. Not only is there a distinct gain in membership, but the field meetings have been better attended, and a greater interest has been shown generally in the proceedings of the club. The membership of the club now stands at 247, of which 12 are honorary members. Eleven field meetings were held during the year, as well as the usual five winter evening meetings for lectures. Apart from the meetings the year is important in the annals of the society for the publication of the new Flora of the Liverpool District, to which we referred in our last issue, which is a work of which the editor, Dr Green, may well be proud. The book is enriched by over 800 illustrations of plants by the able botanical referee of the society, Miss E. M. Wood. We are glad to be able to number both Dr Green and Miss Wood amongst the contributors to the F. N. Q. It is not often that the *résumé* of the season's work is a literary composition of such merit as is the case in the Transactions under notice. We trust the club will have an even more successful season in the one now begun.

The 16th annual meeting of the Vale of Derwent Naturalists' Field Club was held at Burnopfield on March 14. Mr J. Abercrombie, president of the club for the past year, presided over a good attendance of members. In an appropriate address he spoke of the objects of the club, and referred to the study of natural history as being the most interesting and elevating that any one could enter upon. He urged the members during the coming year to continue to show the same interest in the work which had characterised the past year. The field meetings of the past year had been well attended and some useful notes made ; and the winter meetings, according to the secretary's report, were likewise successful. Papers had been read by Mr G. Ord on "Sandstones," on "The Slow Worm" and "The Dragon-Fly" by Mr W. Johnson, and on "Derwentdale" by Rev. W. Featherstonhaugh. The natural-history lectures, which were such a successful feature during the winter of 1901, had to be omitted owing to structural alterations in the meeting-room. It is hoped that they will be renewed next winter. Mr H. F. Bulman, Bancus Close, Burnopfield, was unanimously elected president for the ensuing year, and Mr W. Johnson, Belper Moor, Burnopfield, was again appointed secretary and treasurer. Five field meetings for the summer were decided upon : May 16, Edmundbyers ; June 13, Conbridge-on-Tyne ; July 15, Barnard Castle ; August 22, Allensford and the Sneap ; September 19, Monkseaton and Whitley. An illustrated volume of the club's papers is now in the hands of the printers, and will shortly be issued.

The Hampstead Scientific Society has issued its report for 1902, and it reveals a very satisfactory position. There is an increase of 55 members since the last report, the total now standing at 286. The council have to record with the greatest possible regret the loss sustained by the death of the distinguished president, Sir Richard Temple. He has been succeeded by Sir Samuel Wilks. No less than 36 meetings were held in 1902, a fact which amply testifies to the energy and enthusiasm of the officials and members. The council desire to place on record their high appreciation of the valuable services rendered to the society by the hon. secretary, Mr Basil Martin, who has occupied this post since the formation of the society to the present time. The report contains a *résumé* of the proceedings at the meetings, the papers contributed being of the most varied and interesting nature.

If any one doubts the right of archæology to hold a prominent place in our field work we advise him to read the Proceedings of the Somersetshire Archæological and Natural History Society for 1902, which we have received. There they will find 120 pages of matter devoted to the results of the year's work on this subject, and excellent work it is. We regret space forbids more than a mere mention of the subjects, of which Excavations at the Glastonbury Lake Village are among the most interesting and best illustrated. This society has now no less than 612 members, including honorary members, and includes some very well-known workers amongst its list. All British archæologists should possess these Proceedings, which are published at 10s. 6d. to non-members.

The Transactions of the British Mycological Society for the season 1902 contain the report of the Hereford Foray and complete list of the Fungi gathered, an article by M. C. Cooke on Recent British Fungi (coloured plate), one on *Acrospeira mirabilis* (plate) by R. H. Biffen, Notes on a Species of Stilbum by Miss Lorrain Smith, and Some Notes on Fungi New to Britain by Miss Lorrain Smith and Carleton Rea (hon. secretary), as well as two other contributions.

The 'Essex Naturalist' (the journal of the Essex Field Club) for December 1902 is full of good things, as the Transactions of this club always are. We would specially draw attention to the article on the Spiders of Epping Forest by F. P. Smith (with 3 plates), a most valuable and instructive contribution for field workers; and, secondly, to Mr Lewis's paper on the Oak-Galls and Gall Insects of Epping Forest. The membership of the club is reported at 284.

The 33rd Annual Report of the Wellington College Natural Science Society is on the usual lines, and contains short notes of the various lectures and papers read during the year, and the sectional reports. It is very gratifying to see the attention paid to natural science in some of our public schools nowadays, and this is an example.

Correspondence.

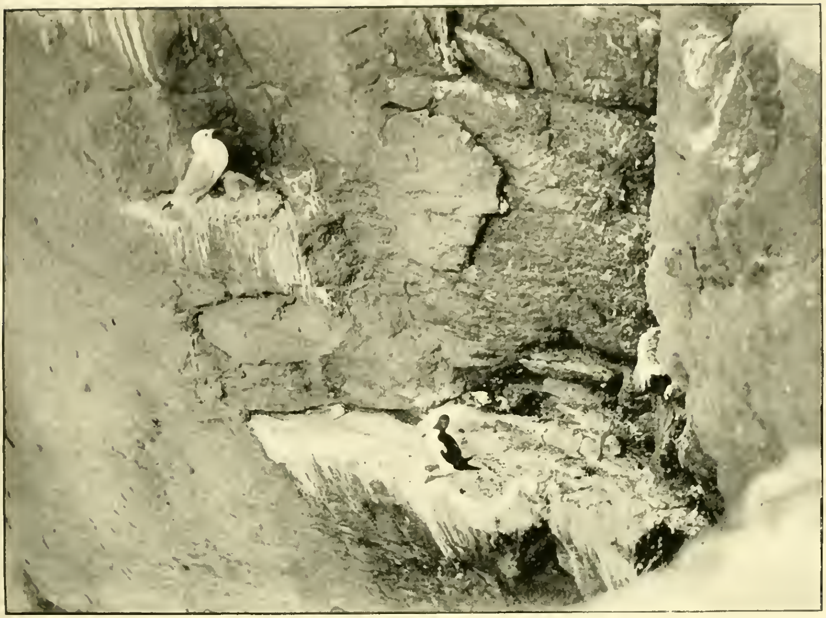
The Duty of Field Clubs.—"The thanks of all members of field clubs are due to the F. N. Q. for directing attention to this question, which in my opinion is at the bottom of the want of success seen in some of these societies. We are all agreed, I take it, that your editorial pointed out a weak spot in directing our secretaries to try and give us more teaching in scientific principles and less elaboration of minute detail. But there is still another failing which was not referred to, but which I believe to be a very common one in such clubs. Some may regard it as a virtue; I hold it to be an abuse of opportunities. I refer to the undoubted tendency there is in field clubs to degenerate into mere picnic societies for the enjoyment of a pleasant outing in the country amid pleasant scenery —a sort of mere relaxation, in fact, from the ordinary routine of daily work, where one meets a number of pleasant companions under attractive circumstances. I do not for one moment imply that all field clubs organise their excursions on these lines—in many cases really good work is done on these field days; but the fact remains that the majority of those attending in some clubs do so in the holiday-making spirit alone. I have seen in several cases a new club formed in a town, exhibiting great enthusiasm and energy for a season or two, and then dropping away into the picnic stage. I enjoy a picnic as well as any one, but I do not look to my one scientific club to provide it. What is the remedy?"—"ANOTHER FIELD NATURALIST."

(We fear that our correspondent's complaint is only too well founded in some cases, by no means in all. The remedy, in our opinion, is to be found in what we advised previously—viz., interest the members in the great things around them, and give less attention to the minutiæ on these occasions.—ED. *F. N. Q.*)

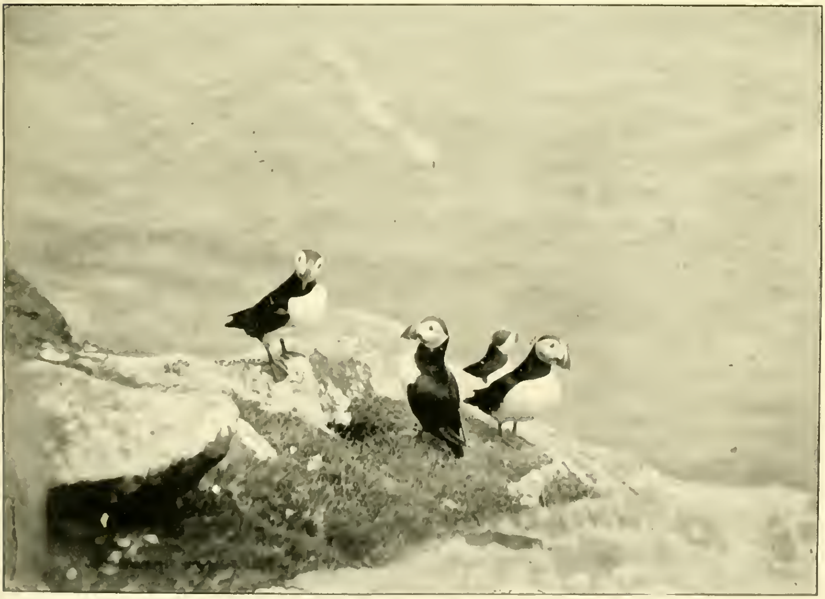
Spring Appearance of Adders in Scotland.—"The open weather of the early spring months of this year has had the effect of bringing out the adders from their hibernating quarters somewhat early. The Glasgow 'Citizen' of March 16 reports the capture of three adders on Warbla Hill, Langholm, the largest measuring 21½ inches, the other two a little smaller."—DAVID M. MUIR, Crossmyloof, Glasgow.

"I enclose an adder killed here to-day, February 20,—surely very early for adders in Scotland. It is a male, 22 inches long."—JAS. BARTHOLOMEW, Kinnelhead, Beattock.

The Natural Attitude of Puffins.—"Whilst showing some snap-shot photographs of puffins to two naturalist friends lately, they both noticed the attitude taken up by the puffins. I have looked up several books, and in all cases the plates represent the puffin as almost sitting on its tail, which my photographs enclosed all show it does not do. I should be glad to know what is the recognised attitude for the bird to take up,—



KITTIWAKE AND YOUNG; AND RAZORBILL AND EGGS.



Photos by Thomas Tait. *Copyright reserved.*

PUFFINS AT CLO HEAD, SUTHERLAND.

whether they always stand as shown in these photos, or if earlier in the season they take up a position more like the razorbill in the other photo. I am told also that they partially shed their beaks soon after the breeding season, and should like to ask if this beak is specially adapted for holding the small fish which they seem to bring in great quantity for feeding their young."—THOMAS TAIT, Broomend, Inverurie, Scotland.

(We have much pleasure in reproducing Mr Tait's interesting photographs of puffins (*Fratercula arctica*) taken at Clo Head in Sutherland. Also photos of the razorbill (*Alca torda*) and the kittiwake (*Rissa tridactyla*), the last two taken at Handa, Sutherland. We shall be glad to hear from correspondents who have observed these birds in nature as to the position they usually take up. As photographs cannot lie in a question of this sort, it is certain that puffins do stand sometimes as here represented. The point is, whether this standing attitude is due to alarm at the sight of an intruder and is a prelude to flight or movement, or whether the birds naturally assume this position when at rest. The puffins in Mr Tait's photo appear as if they decidedly had their eye upon the photographer. With regard to the bill being shed, Mr Seebohm in his 'History of British Birds' says: "After the autumnal moult the sheath of the basal half of the bill is cast, as are also the warty red skin round the gape and the appendages above and below the eye." F. G. Aflalo in 'British Vertebrates,' p. 291, says: "Instead of putting on smarter courting plumage, it grows a larger bill at breeding-time, and that protuberance becomes, moreover, brightly streaked with red and gold. In autumn this attraction is shed piecemeal." The coloured plate of the puffin in Lord Lilford's 'Birds of the British Islands' shows these colourings, and represents the bird as more standing than sitting. Richard Kearton in 'With Nature and a Camera' has an illustration of four puffins, one of which is certainly standing; in the other three it is not easy to say whether the tails are touching the rock or not, as they are facing the camera and apparently looking at the artist.

A full description of the changes which the beak and the palpebral appendages of the puffin undergo was published in the 'Zoologist' of July 1878, to which our readers are referred for detailed information of this interesting process.—ED. *F. N. Q.*)

The Green-backed Gallinule.—"Mr Bird's very interesting article on this bird (*Porphyrio smaragdonotus*) prompts me to send you the record of a specimen shot in Rutland. A very handsome gallinule of this species was killed at Lyddington, Rutland, on the river Welland, on March 5, 1898, and is now well mounted and in the possession of Mr Manton of Lyddington. Neither the year nor the month agrees with those mentioned in Mr Bird's article, but the bird may have been a straggler from the same migration. Otherwise our bird will be a wanderer from the Duke of Bedford's waters at Woburn."—REGINALD HAINES, Uppingham, Rutland.

Local and Common Names for Animals.—"In addition to the names referred to by Mr Bevir (F. N. Q., vol. ii. pp. 23, 24) the following may also be given—all for the weasel: Whitrit, whitret, whitred, quhittrit, and whassel (Scottish); club-tail cane, little cane, and kine (Surrey); beale (Sussex); ressel, rezzel, rizzle (Yorks); mouse-hunter and mouse-hunt; mouse-killer; clubster (Cleveland); whitethroat (the male in Suffolk).

"The stoat is known also as lobster or lobstert (Norfolk). Mr Forrest gives hardy-straw as a local Shropshire name for the common shrew (F. N. Q., vol. ii. p. 89); this is artystraw in Yorkshire. Hardy shrew is a further form of this name."—H. B. WATT, 3 Victoria Drive, Glasgow.

Rutland Birds.—"With reference to Mr Haines' most interesting account of birds in Rutland, I should like to ask if the following birds are not included in the avifauna of that county: Marsh tit (*Parus palustris*), long-tailed tit (*Acredula rosea*), chiffchaff (*Phylloscopus rufus*), tree-sparrow (*Passer montanus*), and coot (*Fulica atra*).

"On p. 43, F. N. Q., vol. ii., *Turdus viscivorus* is given 'missel-thrush.' Surely 'mistle-thrush' is better, as reflecting its fondness for the mistletoe berries. This bird has many local names: in South Lancashire it is the shercock, and from its alarm cry the stormcock, which also refers to its habit of revelling in a January storm, singing then from high tree-tops amid wind and snow.

"I should like to urge the positive necessity of giving the scientific names of every species of bird mentioned, in view of the local confusion in the numerous local bird names."—C. E. READE, Manchester.

(We cannot enter into the controversy of "missel" *versus* "mistle," which has recently been debated at great length in the columns of the 'Field.' We quite agree with our correspondent that the specific name of a species should be given unless there can be no possible mistake in the bird referred to. Contributors, please note.—ED. *F. N. Q.*)

[*Advance Copy.*]

CHELTENHAM, *April* 1903.

DEAR SIR,—Recently it was proposed to form in Gloucestershire an Association for the Protection of Wild Plants upon the lines of the Devonshire Association. The Cotteswold Naturalists' Field Club was asked for its advice and approval. The club, seeing that the matter was full of difficulties, referred it to a committee.

After a thorough investigation of the facts and of various evidence, and after much correspondence, a visit to Devonshire by one of the committee, and an interview with Mr G. Claridge Druce, F.L.S. (author of 'The Flora of Oxon,' 'The Flora of Berks,' &c.), the committee have issued their report. The club has adopted this report and passed resolutions based upon it.

At the interview with Mr Druce he stated that as regards the amendment of the law (*vide* the report) he had already seen Lord Avebury, and intended seeing him again about it this summer. At the same time, he said that it would strengthen the hands of the framers of any Bill if they received the resolutions of the chief Natural History Societies on this question of amendment: he also asked the secretary of the committee to obtain these resolutions for him where possible.

As the questions have been thoroughly discussed by the club, it thinks that copies of the report and resolutions may be useful to kindred societies in starting them upon a consideration of the questions, and it has decided that such copies shall be sent to these societies.

If any resolutions are passed by these societies on the question of an amendment of the laws, and are sent to the secretary of the committee referred to (W. L. Mellersh, M.A., The Gryphons, Cheltenham), they shall be forwarded to Mr Druce, for the framers of the Bill, upon his return from the Ionian Isles.

At the meeting of the club only a general resolution as to amending the law was passed, since the club considered that there were not a sufficient number of landowners present to justify the passing, then and there, of proposals as to such amendments in detail. The club further considered that a resolution on the subject should be a general one, unless the details as to any proposals could be carefully considered at a very full meeting of members, since the definition of wholesale professional plant-stealers, and the basis for a selection of areas to be protected, are questions greatly affecting the interests of landowners.

C. CALLAWAY, D.Sc.
President of the Cotteswold Naturalists' Field Club.

Animal Colouring in Winter.—"The following incident may throw some light on the suggestion made by Mr Beddard in the last issue of the F. N. Q., to the effect that food may have some influence on animal colouring in winter.

"I had a variegated plant which seemed pot-bound, and accordingly put it in a larger pot with fresh soil. To my disgust all the *new* leaves were entirely green. I consulted a specialist, who told me that I had fed it too well, and advised me to soak the plant in water so as to remove most of the soil, and feed it on water only. 'Starve it and it will not have the strength to form the green colouring matter,' was his idea.

"It is evident that the manufacture of pigment must be at the expense of a certain amount of nutriment, and if this process is checked, then either the creature can live on less food, or if food be plentiful, the vital forces can be turned into more useful channels.

"In the arctic winter probably scent will not carry far, and a brown bird would be *seen* sooner than *winded* by the fox; hence the white ptarmigan gains by its colour. On the other hand, the fox, hunting *up* the wind for scent, would be sooner detected by the bird, which by instinct watches *down* wind and trusts to scent to reveal the presence of enemies in the other direction—if its coat were not in harmony with the snow.

"As to piebaldness being fatal, I do not think that a brown-and-white bird would be easy to see if lying low in a country where the tops of rocks or of heather show above the snow; and even in a country covered with snow the surface is not all absolutely flat, and there are lights and shades.

"As a rule, I believe, the vital force which in summer forms pigment is in winter utilised to form the thicker under-covering of down or fur which protects the bodies of most creatures in that season."—ERNEST A. ELLIOTT, 41 Holland Park, London.

Answers to Correspondents.

SEVERAL letters have been sent to us addressed to W. Long, the writer of 'School of the Woods' (Ginn & Co.) We beg to inform those correspondents that Mr Long lives in America. We have forwarded the letters, but hope that any further communications for him will be accompanied by stamps to cover the postage to America. Correspondents will understand, therefore, why they may not have received replies for some time.—ED. *F. N. Q.*

DOUBTFUL, Gloucester.

It is surely obvious that in a journal of this kind each contributor must be held responsible for the statements made in any given article, as well as for the opinions deduced therefrom by the writer. If you doubt the facts stated we shall be pleased to forward to the writer any communication you care to send for him, or to publish in these columns any criticism which seems to us valuable.

O. M. F., Yarmouth.

Two migratory thrushes visit our islands in autumn and winter here. The best known is the redwing (*Turdus iliacus*), which is perhaps most abundant in the well-cultivated midland, southern, and eastern counties. It is the smallest of the British thrushes, gregarious, reaching our shores in flocks towards the end of October or early November, visiting certain localities from year to year. The second species is the fieldfare (*Turdus pilaris*), almost as widely distributed. It leaves us for its arctic breeding-grounds in April, moving from its most southern haunts in March. ('Open-Air Studies in Bird Life,' pp. 177, 178. Charles Dixon.)

T. F. B., Chatham.

Hemp-seed is said to cause bullfinches and other birds to become black.

M. E. S. KERR, Dorchester.

The portion of a snake which you forwarded, and which you say "was found near Dorchester, and looked very like a common adder in colour and markings, except that on seeing it bite I discovered that it had not fangs," is part of a smooth snake (*Coronella austriaca*). This is the third species of snake in Great Britain, and Dorset is one of its few habitats; indeed it was first recorded from that county by the late Mr Frederick Bond and Mr Cambridge. It is very like the adder at a short distance, but on careful examination we find that instead of the zigzag dark mid-dorsal line there are two lines of dark patches on either side of the middle of the back. Its food is mainly the sand lizard.

PUZZLED, Edin.

So were we, by the question. A "vector" in quaternions is "a directive quantity, as a straight line, a force, or a velocity. Vectors are said to be equal when their directions are the same and their magnitudes are equal," which sounds likely. The above answer is taken from the 'Imperial Dictionary,' and we disclaim all responsibility for it, though it is doubtless correct. Please don't ask us any more like that, —we are not an ambulating encyclopædia.

A. F., Northumberland.

Vegetable æthiops is a charcoal prepared by burning *Fucus vesiculosus*, or common seaweed, in a covered crucible.

J. A. G., Grimsby.

The common white stork (*Ciconia alba*) feeds on fish, reptiles, small mammals, worms, and insects. A rare visitor here. Said to show great affection to its young and respect to its old parents.

D. J. H., Leominster.

Certainly not. It is by no means the case that matter printed in the smaller type in this journal is therefore regarded by us as less important or interesting than that in larger type. It is a mere question of space. The small type used is readily seen, and by using it we are able to include a far greater mass of material than we otherwise could. For instance, we look upon "British Field Zoology" as one of the most important sections, but we put it in small type for the reason stated. The same remark applies to the Correspondence and Library columns.

R. M. S., Glasgow.

What a photographer thinks justifiable in portraiture is no concern of ours, but we are quite clear that anything in the nature of "faking" photographs which are supposed to represent animals in nature is absolutely unjustifiable. It is a well-recognised rule in scientific photography. If such a "faked" photograph ever appeared in our columns, it would be because we had been deceived by it, and we should much regret its publication, and take good care to accept no more from the same source. A faithful representation of the subject is of infinitely more value than securing an artistic picture.

J. G., Tunbridge.

We are flattered by your idea, and have no doubt that it could be carried out with advantage to field clubs. But we think you will agree with us that such a suggestion must come from the field clubs, not from us. There can be no doubt that organisation would accomplish more than individual efforts.

Young Naturalist's Quarterly Competition.

In order to encourage the study of natural history and other scientific subjects, the Editor offers prizes every quarter for the best essays sent to him on the prescribed subjects. The competitions are open to all young students and scholars, and are specially intended for the pupils of public schools, colleges, &c., which have natural history and other societies for their scholars. Competitors must send their essays in their own handwriting, together with a statement from their head-master or clergyman certifying the essay to be the original and unaided work of a competitor under nineteen years of age. Essays should not exceed 1000 words, but may be as short as desired. In awarding the prizes, the Editor, whose decision is final, will take into account both the accuracy of the matter and its arrangement. The result of the competitions will be announced in the following quarter's issue. The successful competitor must then select his or her prize from those offered, and inform the Editor at once where the prize is to be sent to.

The Editor reserves the right to publish any of the essays sent in.

Note.—The subject for the next quarterly competition is, **"The Function of Flowers in the Plant World."**

Competing essays (with statement of age and originality) must reach the Editor of the 'Field Naturalist's Quarterly,' 17 Hartington Place, Edinburgh, on or before July 25, 1903. Envelopes to be marked "Competition Essay." The prizes will be announced in the next issue of this journal. First prize, any two of the following books; second prize, any one of them:—

School of the Woods (Long).
Beasts of the Field (Long).
Fowls of the Air (Long).
British Vertebrates (Aflalo).
A Year with Nature (Westell).
Fauna of Shropshire (Forrest).
British Serpents (Leighton).
The Vivarium (Bateman).
Open-Air Studies, Geology (Cole).
Nature Studies, Botany (Scott Elliot).
Norfolk Broads and Rivers (Davies).
Photography for Naturalists (English).
Field Naturalist's Handbook (Wood).
&c., &c., &c.

Notices.

TO CONTRIBUTORS AND CORRESPONDENTS.

ALL articles and other communications (typewritten if possible) intended for publication, and all books, Transactions, papers, &c., for review or other notice, should be sent to the Editor, 'Field Naturalist's Quarterly,' 17 Hartington Place, Edinburgh.

Business communications should be addressed to the Manager at 45 George Street, Edinburgh.

Contributors are requested to write the department to which their communication refers (*e.g.*, Ornithology) on the envelope.

Every effort will be made to return unused communications where stamped addressed envelopes are enclosed for that purpose, but contributors are advised to keep copies of their MSS., as the Editor cannot undertake responsibility for their non-return. Photographs or other illustrations sent for publication must be original and the absolute property of the sender.

The full name and address of the sender must accompany every communication. Anonymous communications will not be noticed. Correspondence is invited on all matters of general interest which fall within the scope of work usually done by field clubs and kindred societies. Original observations on the habits of living animals and plants will be specially welcomed.

The 'Field Naturalist's Quarterly' will be issued in February, May, August, and November; and all communications for the ensuing issue should reach the Editor at least one month in advance.

To Subscribers.

The annual subscription to the 'Field Naturalist's Quarterly' is 10s. post free. Single issues 2s. 6d. each. Subscriptions, which may begin with any issue, should be sent to the Manager, 'Field Naturalist's Quarterly,' 45 George Street, Edinburgh.

The 'Field Naturalist's Quarterly' may be ordered direct from the publishers, Messrs Blackwood & Sons, or through any bookseller or newsagent.

Copies of Nos. 1, 2, 3, and 4 of the 'Field Naturalist's Quarterly' can still be obtained by new subscribers who wish to have the volume complete.

Cases, in green art linen, for binding volume i. of the 'Field Naturalist's Quarterly,' may be obtained from the publishers, price 6d. (post free 7d.) The publishers are also prepared to bind volume i. in the above style at 9d. per copy (including postage 1s.)

To Advertisers.

Applications for terms and spaces to be sent to the Manager, 'Field Naturalist's Quarterly,' 45 George Street, Edinburgh.

Special terms for selected places, or a series of (changeable) advertisements.

The Editor begs to acknowledge the receipt of the following books:—

The Natural History of Plants. Part I. By Kerner and Oliver. London and Glasgow: Blackie & Son. Price 1s. 6d. net per part (16 monthly parts).

A Book of Beasts and Birds. By Gambier Bolton. London: George Newnes & Co. Price 5s.

The Book of British Ferns. By C. T. Druery, F.L.S. London: George Newnes & Co. Price 3s. 6d. net.

The Book of the Wild Garden. By S. W. Fitzherbert. London: John Lane. Price 2s. 6d. net.

Trees and Shrubs for English Gardens. By E. T. Cook. London: George Newnes & Co. Price 12s. 6d. net.

Variation in Animals and Plants. By H. M. Vernon. London: Paul, Trench, Trübner, & Co. Price 5s.

The Natural History of Animals. By J. R. Ainsworth Davis. Half-vol. II. London: The Gresham Publishing Co. Price 7s. per half-volume.

Photography for Naturalists. By Douglas English. London: Iliffe & Sons. Price 5s. net.

My Nature Notebook. By E. Kay Robinson. London: Isbister & Co. Price 2s. 6d.

Open-Air Studies in Bird Life. By Charles Dixon. London: Charles Griffin & Co. Price 7s. 6d.

The Primrose and Darwinism. By A Field Naturalist. London: Grant Richards. Price 6s. net.

The Editor begs to acknowledge the receipt of the following:—

Knowledge—January, February, March, April.
The Naturalist—February, March, April.
Nature Study—February, March, April.
The Avicultural Magazine—February, March, April.
The Animal's Friend—February, March, April.
The Bulwark (three numbers).
The Yorkshire Weekly Post (two numbers).
The Veterinary Record (three numbers).
The American Naturalist—January, February.
The Essex Naturalist—December 1902.
Transactions of the British Mycological Society, 1902.
The Avifauna of the Outer Hebrides. By J. A. Harvie-Brown, F.R.S.E.
In Memoriam, Thomas Edward Buckley. By J. A. Harvie-Brown, F.R.S.E.
Annual Report, Wellington College Nat. Science Soc., 1902.
Proceedings, Somersetshire Archæol. and Nat. Hist. Soc., 1902.
Blackwood's Magazine—March.
The Lancet—March 28.
Proceedings of Liverpool Naturalists' Field Club, 1902.
Report of Hampstead Scientific Society, 1902.
Bird Notes and News (Soc. Protec. Birds).

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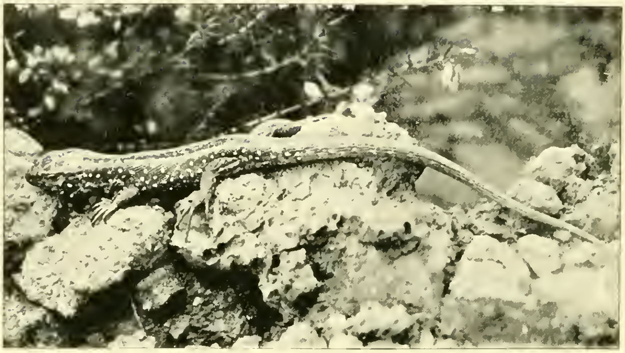

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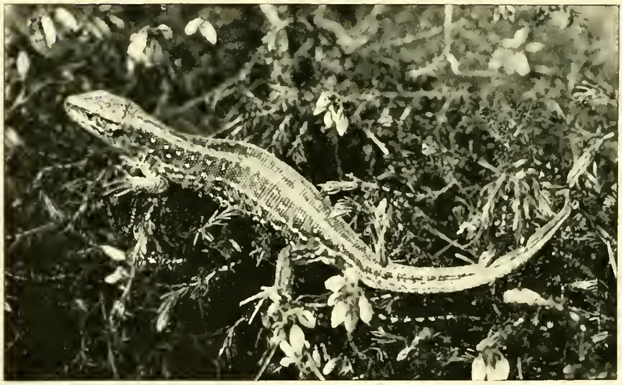

Photos by Douglas English.

SAND LIZARD (FEMALE).

The Field Naturalist's Quarterly

VOL. II. AUGUST 1903 NO. 7.

Editorials.

WE have always contended that the value of the work done by the field societies and clubs in this country is but imperfectly recognised both by the general public and by those who are considered to be more "scientific" workers. We are also of opinion that this apathy, and in some instances almost contempt, for field work is gradually becoming a thing of the past, chiefly because the increase in the number of publications which deal with field work is giving that work greater prominence, and also because these societies are becoming more and more numerous, and therefore extending their influence. We have had in our correspondence columns recently examples of the complaints made against the methods of some of these societies, which in some cases are doubtless well founded; by no means in all. Another correspondent writes in this issue pointing out what he considers another failing, and one which certainly deserves consideration. He says that many clubs fritter away their time and energy in *aimless* observation of anything and everything which happens to come to hand, instead of undertaking some definite plan of campaign suitable to the particular district in which the club works, and which would be certain to yield valuable and new results. We are by no means sure that any observation can be utterly aimless, but we certainly agree with his argument, and, indeed, we know that many clubs act on the principle suggested. It will generally be found that the objects of field clubs, as set forth in their laws and constitution, are adapted to their own locality. The question, of course, is, whether the members duly carry out those objects. An examination of the reports and transactions of a number of societies will prove that in very many instances an effort is being made to obtain complete records of the fauna and flora of the district, and in some instances comparatively large monographs have been published as the result of these successful labours. We may mention, as an example, the excellent *Flora of Liverpool and District*, recently brought up to date and issued by the club of that city, and other instances could be given of equally valuable publications. Still, there is no doubt that a great deal remains to be done in this direction, more particularly in the zoology department. There are many animal species in this country whose distribution in the various counties and districts is very imperfectly known, and about which it is impossible to get accurate information. Especially is this the case with the smaller mammals, and some of the amphibians and reptiles, concerning which one may inquire in vain for evidence of their relative frequency of occurrence. In many cases the information actually does exist, but owing to the imperfect means of communication between the various societies, it is extremely difficult to obtain, or to find. Any plan by which all our societies could be made aware of what is being done by each other, and which at the same time did not involve great expense, would be welcomed as a real boon to field naturalists. Societies cannot afford to distribute their transactions broadcast, nor is it to be expected that they should. What is wanted is a means of reference which all workers can get ready access to, and which will give at a glance the titles of all subjects which have been dealt with in all the clubs in a given time —the past year, for example. We have our own ideas as to how this might be accomplished, but prefer to await developments for the present. What we are anxious to impress upon our clubs is the urgent necessity for such a system.

* * * * *

An excellent example of the valuable results to be obtained from working at a definite problem is to be found in Mr. Blundell's note on the "Reappearance of the Smooth Snake in Berkshire" in this issue. Here is a case of a rare animal in this country, known to be formerly not uncommon in a particular district, but since it had not been recorded for some twenty years in the neighbourhood, it was most naturally regarded as having become extinct locally. As the result of some arguments addressed to the Natural History Society at Wellington College, some of the students made careful search, and ultimately, on 18th June 1903, Mr. R. H. A. Morshead had the satisfaction of capturing a specimen of the supposed extinct reptile. In the case of this particular species of snake, we have elsewhere expressed the opinion that such a result would be likely to follow a close search. The smooth snake is found usually only in some few very restricted areas in Dorset, Hants, and Surrey, but at a short distance it is so like the adder, that an ordinary observer would be most likely to mistake it for the venomous species, and destroy it without further examination. In the case of Berkshire it happens that our opinion was justified, and it would be most interesting to ascertain if a similar search in other parts of the counties mentioned, where the nature of the ground appeared suitable to its needs, would result in a further discovery of its existence. The moral for the naturalist is that he cannot be too careful in coming to a conclusion as to the restricted distribution of a species; it may simply be that it has not been sufficiently carefully looked for in other places. In any case, this addition to our knowledge of the distribution of *Coronella austriaca* in this country is a valuable observation, the direct result of field work with a special aim in view.

* * * * *

Last year several instances were given in these columns of the adder having been observed swimming in water, notably one by Mr. Eagle Clarke. It may interest some of our readers to know that a few weeks ago the editor of the *F. N. Q.* encountered an adder on a stone in the water some six feet from the bank of a river in the Highlands of Scotland, and secured a snap-shot photograph of it as it took to the water. The photo was, however, much underexposed, and though showing the reptile distinctly, will not reproduce well unless intensified. Should this process render it more satisfactory, we hope to reproduce it in an early issue.

* * * * *

The editor would be grateful if any field naturalists who are in a position to give him information on the lizards of their own district would do so. The information particularly wanted is the relative frequency of the slow-worm and the common viviparous lizard, or whether they are absent.

The Place of "Nature Study" in Education.

By R. Hedger Wallace.

I

"NATURE STUDY," in the sense of fostering a loving study of nature, has of late been so frequently advocated, that it may not be out of place if the attention of all interested be now drawn to the problem—How can children be induced to take this very desirable interest in nature during their school life? Emerson has written "*that the best part of a boy's schooling is that which he gets on his way to and from school*," and we take it that it will be admitted that this schooling he obtains simply through satisfying his natural nature hunger. It is a purely voluntary act, and in this fact, perhaps, lies the secret of success, so that when any form of nature teaching is taken up by the teacher, it follows that his main object should be to find for his pupils appropriate opportunities and conditions for the exercise of their activities naturewards. If this be accepted, the question still remains, How is the teacher to be induced to do this? Sir John Gorst, in his address to the Educational Section of the British Association, told teachers that—

> "If children in village schools spent less of their early youth in learning mechanically to read, write, and cipher, and more in searching hedgerows and ditch-bottoms for flowers, insects, or other natural objects, their intelligence would be developed by active research, and they would better learn to read, write, and cipher in the end."

There are many, no doubt, who will agree with Sir John Gorst, but the majority of teachers, we are informed, regard the statement quoted above as nothing more and no better than the irresponsible rhetoric of an irrepressible politician, and as a venture quite outside the pale of pedagogical recognition.

A teacher, from his professional training, is more or less a teaching machine. Unless, therefore, teachers can be shown that a subject, even though indirectly, will still in the end assist in mind training, which is their professional work, there is little hope of converting the rank and file and getting them to assist the movement. The task that naturalists and nature lovers have therefore to set themselves to accomplish, is first of all to make loving nature lore attractive to children, and at the same time they must so present the matter to teachers that they will also be interested and become sources or centres of encouragement for the children, otherwise non-sympathetic teachers have the power to suppress and practically to extinguish a child's natural instincts natureward. Nature study exhibitions and reports, also nature study manuals and text-books, all address themselves to the teacher. We do not know of any true nature study work that is addressed to children, at anyrate all such books that we are aware of are intended to circulate among their elders. Of course, there are various readers—"countryside readers," "nature knowledge readers," etc.—that deal with natural phenomena, and to these no objection can be made, for, as their name indicates, they are books intended to be used solely on the literary side of the school, and if they are ever misapplied and used as a science or natural history text-book, prompt action should be taken by all nature lovers, so that the matter may be rectified.

As all our authorities who are interested in nature and country life want to get the children in our primary schools to take an interest in nature lore, the only feasible way seems to be, to approach them through the teachers in such schools. These teachers, however, have to work under a "code," and if any matter, however interesting, is offered to them which is not defined in this code, they are very chary of having anything to do with it. The only way, therefore, to make the movement general is to place it before them in the light and on the ground that if they will interest themselves and their children in nature lore it will in the end repay them by reacting favourably on the compulsory code work. Under such circumstances it is difficult to eliminate the mind-training idea. It is therefore necessary that we should keep before us a definable idea of what constitutes "nature study." According to the authorities of Cornell University, the original centre of the movement, nature study is—

> "Seeing the things which one looks at, and the drawing of proper conclusions from what one sees. *Nature study is not the study of a science*, as of botany, entomology, geology, and the like. . . . *It does not attempt* to teach elementary science, nor primarily *to popularise knowledge. It is wholly informal and unsystematic*, the same as the objects are which one sees. *It is entirely divorced from definitions or from explanations in books.* . . . It simply trains the eye and the mind to see and to comprehend the common things of life. . . . *If nature study were made a stated part of a curriculum, its purpose would be defeated.*"

The parts in the above quotation which we have italicised give to nature study, we think, some definition. First of all, it must be regarded as an influence rather than as a school subject; at anyrate it is a thing that cannot be time-tabled. Those who have taken it up in the proper spirit use it generally, we find, as a rest exercise. If, say, ten minutes here or fifteen minutes there at the end of a lesson period are taken, when, say, after a dose of subtraction or multiplication the children are getting dull and wearied, and if the teacher, to give them a rest, begins to ask the children in this interval about their nature hobbies, and if by judicious questioning and by skilfully dropped hints encourages them and opens out to them new channels of inquiry, then such work may well be accepted as nature study. On the other hand, to give a class of children a primrose apiece, and then to give an object lesson on it, even though the lesson be skilfully given and the children's answers be based on their own individual observation of the specimens in their hands, still such work is not nature study, but rather a lesson in natural science, and should therefore not be allowed to figure as nature study. Those who are interested in nature lore, especially field naturalists, should do everything in their power to prevent the natural history or natural science lessons that are given in schools, however elementary or advanced they may be, and whether scheduled and time-tabled or not, being called "nature study." At a recent conference of science teachers one of the speakers is reported to have said: "I am sometimes asked if we take nature study in our school. Well, I must confess we don't take it under that name, but as the botany work is done from nature, and, when possible, from *living* plants, I think we have a right to call it nature study if we wish to do so." This shows that what must be made perfectly clear to all who hold such opinions is, that nature study is not in the slightest degree concerned with any form of physical, meteorological, geological, botanical, or zoological teaching. What it desires to further is that close intimacy with nature, that vividness of outlook which is the foundation of the craft or lore of the shepherd and gamekeeper, the farmer and gardener, the sportsman and scout, and the fancier and field naturalist. Our forefathers carefully watched the various connections between natural objects, so that the fields and lanes, flowers and trees, birds and beasts, became the pages of their almanac. No form of science teaching can ever give to a boy or girl this lore, it must be personally acquired by direct contact with nature, and "nature study" is the term applied to the attempt to awaken the interest of children in this world that lies outside of themselves, and in the life which surrounds them. This lore cannot be gained through occasional hasty and indiscriminate glances, for correct impressions of common objects can only be gained by frequent and repeated inspection. A course in nature lore must develop the faculty of observation, and, therefore, though it is not the primary object of nature study, yet it is its inherent quality, and this must be emphasised if the pedagogue is to be gained over.

There is really nothing new in nature study. Generations have been charmed by the music of the words, "tongues in trees, books in the babbling brooks, sermons in stones," but little has been done to realise their meaning, or to give them a meaning; yet, after all, nature study is only a rejuvenescence of the natural history of the ancients, a return to the methods of Gilbert White. The problem is—How are we to get children in school interested in field natural history? They must first of all, we believe, be encouraged to make outdoor observations only. If this is made a *sine qua non*, much of the object lesson teaching and natural science teaching in schools, now paraded as nature study, will fall back into their true position. To analyse structures, separate fibres, or count feathers, is not the type of work a student of nature undertakes, for he can study nature without being seized with the modern scientific spirit, which, according to Mr. Wells, means a burning desire to dissect and analyse entrails. Object lessons and science teaching in schools have their own merits and functions, and should be taught as such, and not disguised under another name, though the latter be more attractive. We shall have made some progress if we agree that nature study should only be referred to incidentally and informally during school hours, that it is not concerned with the object lesson teaching of natural phenomena or with the natural science teaching given in the school, and that the observation it requires and inculcates must be made mainly out of doors. There are still other points to be formulated if it is to be presented and advocated as an educational factor.

(*To be continued.*)

Notes on the Nests and Eggs of Birds.

By Rev. M. C. H. Bird.

(*Continued from p.* 137.)

We come now to the most fascinating diversity of coloration: what is its explanation, and upon what does the special colouring of eggs depend? Primarily upon the species; secondly, upon the situation and architecture of the nest; thirdly, upon the health of the parent bird; but food (*pace* Pycraft on the Shrike, *Bird Life*, p. 164) has little or no influence, as anybody may easily prove by experiment with two barn-door hens, one of the brown, the other of the white egg-laying type. For much variation in the texture of egg-shells we should have to go to foreign birds to find extreme examples, but they may be typified amongst local breeders as being extremely smooth in the pheasant, smooth and glossy in the kingfisher, dull and chalky in the grebe, and pitted in the case of the French partridge. The colour of an egg has no reference to that of parent bird or chick, but in domestic poultry tinted eggs are chiefly laid by fowls with dark plumage or yellow skin.

White was probably the primitive colour of the eggs of all birds, as it still is practically of all reptiles. The conspicuous white was originally hidden by the eggs of reptiles being buried, or dirtied by the parents' feet; and so we still find that, where possible, the eggs of all birds are covered with a plain white shell, superficial shades and markings being only added for protective purposes. Where eggs are laid out of sight in holes in the earth or in hollow trees or in crevices, entirely concealed from the light, and where the parent bird makes an open nest and feeds nocturnally, there the eggs are also mostly white, or at anyrate of a very pale tint. So clean are the eggs of the great crested grebe when first laid that anyone who had only seen those of this species which had been for a day or two in contact with the rotting vegetation of which the nest is composed would scarcely be able to identify a perfectly fresh egg. Other birds which lay an almost white egg with thick shell in open nests are the cormorants, gannets, swans, and harriers. These are large and powerful birds, all well able to protect their treasures.

Where eggs are laid in holes of the earth, trees, or buildings, entirely concealed from the light, there we should expect to find least colouring matter in the shells; whilst, on the other hand, the more the nesting habits of the bird expose the eggs to the noonday glare, and so to passers-by, the more darkly are they coloured. Light, too, is inimical to protoplasm and the growth of germ life generally, and so unconcealed eggs are usually dark in colour or thick in texture of shell. Purely white eggs are always by some means protected both from the direct rays of the sun and prying eyes. The eggs of the house-sparrow, with its double nesting habits, sometimes building in a tree, at others in holes, vary immensely even in one and the same nest, in the density of their surface markings, and may be in a transition stage. This is a bold and hardy bird, and a careless architect: but evidence of a process of evolution being at work may be discovered in the one unusually light-coloured egg which nearly every clutch of the tree-sparrow contains.

Tinted eggs, or eggs with a uniformly coloured shell without any darker surface markings, are produced by those birds which build chiefly in holes, and as with those birds which lay clear white eggs with red spots, in similar situations, so here, those which make the most elaborate nest in larger or more open holes, these lay eggs more highly coloured in their ground tint, and also with more conspicuous superficial markings, and *vice versâ*. For example, starlings' eggs are sometimes almost white, and their shell is comparatively thin and clear: these birds make but a poor nest, and the eggs are generally well hidden from the light; whilst the handsome eggs of the jackdaw are laid in a far better nest and are more or less exposed to daylight—in fact, several instances are on record of the jackdaw building an open nest. It has been suggested that birds nesting in comparative darkness require white eggs in order that they may be able to see them; but the young, when hatched, are not all covered with snowy down, and surely it is more necessary that their parents should be able to locate *their* exact whereabouts than that of the hard covered eggs, although I am well aware of the fact that egg-shells become more and more fragile as hatching time draws near; but at such a state of incubation being reached the incubating parent seldom leaves the nest, and thereby lessens the risk of breaking its eggs by getting off and on to them again.

The persistency of white eggs is probably accounted for by nature's parsimony: she knows no waste, and has seen no necessity to supply extra colouring matter for eggs which need it not, either for protection from the sun's rays or from more concrete enemies. Amongst British birds, at anyrate, we shall find that uniformly tinted eggs, without any spots or markings, whatsoever be their ground colour, are all more or less hidden from light and view,—either by the situation of the nest, as in the case of starling, redstart, pied flycatcher, wryneck, woodpecker, and some ducks; or by a well-constructed nest in addition, as is the habit of the nightingale, whinchat, wheatear, and dipper; or by being covered by the parent bird on leaving the nest, of which means of protection the ducks and grebes are familiar instances. During the past few years there has been a discussion in some of the natural history periodicals upon Darwin's statement about the moorhen thus covering its eggs. I have found hundreds of moorhens' nests in all sorts of situations, but I have never come across a batch of covered eggs, not even on the back river at Cambridge, where I once knew of two nests of this species at the same time, one of which must have had a hundred boats pass within a foot or two of it every day; the other was within a stone's-throw of the bridge at the bottom of Trinity Hall Gardens. None of our local marshmen to whom I have applied for their views upon the subject ever recollect having seen moorhens' eggs covered, although both they and I have come across instances in which the tops of tall surrounding or overhanging vegetation has occasionally been bent down so as to partly conceal both eggs and nest.

This device is constantly practised by the redshank. Let me make a slight further digression in order to pay tribute to the thoughtfulness of that most observant of marshmen, Alfred Nudd of Hickling. Several years ago, long before I had seen reference made to the fact in print, he mentioned to me in other words the mimicry between the coloration of coots' eggs and the dead leaves of the surrounding reed stems stained by microscopic fungi. (Cf. Wallace on *Darwinism*, and *Zool.*, 1889, p. 547.) This reference to mental impression reminds us of Jacob's successful experiments upon Laban's cattle.

There is a marked exception to the rule of white eggs being generally well concealed in the Pigeon family: the ring- and turtle-dove make rude open nests, and lay purely white eggs. Several attempts have been made to explain this oological crux. It has been suggested that both nest and eggs are usually hidden from the view of overhead marauders by the dense foliage of the trees in and amongst which they are placed. The stock-dove, being an exceptionally early breeder, lays in holes in the ground, in rabbit burrows, or under a furze-bush on the ground, or in hollow trees. The ring-dove breeds somewhat later, but its earliest nests—that is, those built before vegetation is well advanced—are never, so far as my experience goes, placed in deciduous trees, but amongst the ivy growing around them or in evergreens. A second explanatory suggestion is that the platform shape of the nest of wood-pigeon and turtle-dove admits of the light passing through between the dark sticks of which these nests are entirely composed, and that consequently the white eggs lying on the dark sticks are rendered inconspicuous by the lights and shadows caused by these interstices. As the young grow heavy these nests are solidified and strengthened by the accumulating excreta of the nestlings, and so the supposedly protective light-holes are closed up when the necessity for their presence has passed away. A third and more probable explanation is as follows:—these birds lay two eggs only, and begin to sit directly after the first egg is deposited. Thus the bird's own body hides the conspicuous coverings of its embryo offspring, and that so successfully that in spite of much and constant persecution the wood-pigeon increases rather than diminishes in number, whereas the stock-dove (the rabbit-hole breeding race, in Norfolk at anyrate) becomes less numerous every year.

We now come to the most highly specialised eggs in point of colour, those having a tinted ground, with spots, streaks, or blotches of a darker hue superadded. These are all laid in more or less open nests, and are adapted generally to their environment for the purpose of concealment. This means of protection is perfected in the Waders, and its absence more or less in the Warblers is compensated for by the selection of a less conspicuous site for, and a more careful construction of, the nest. The general tone of colour in the plumage of the incubating parent is also more in harmony with surrounding objects. The nightjar is a very good example of this latter exception. Where the plumage of the sexes differ, and the male alone incubates, display has to give way to caution, and he, as in the case of the dotterel, has to be contented with a more sombre garb than the female.

We may now perhaps be in a position to answer the question partly, if not quite satisfactorily, as to why the nest of the coot should differ from that made by the great crested grebe. Building in almost juxtaposition, and obtaining their own and their offspring's food-supply from the same waters, yet the composition of that food differs: insects and their larva enter into the dietary of both species, but the adult coot is almost entirely a vegetable feeder, whereas the parent grebes subsist upon fish alone. Their prey is fugitive, and needs pursuit, entailing far longer absence from the nest than is the case with the coot: hence we may argue the need for the miniature hotbed which the nest of this species resembles. Again, why should the coot be able to leave her eggs uncovered whilst she is off feeding, whereas the grebe carefully hides hers up? The eggs of the former are protectively coloured, whereas those of the grebe are not. To show the sufficiency of the peppery dots of colour upon the eggs of the coot to protect them from foes, let me relate an unsuccessful experiment of my own. In the spring of 1893

I rescued five unincubated eggs of the loon from a taxidermist's shop, and put them into three coots' nests. Within two days every one of these grebes' eggs were sucked—presumably by crows—whilst numerous nests full of coots' eggs were left unharmed near by. The slight difference in the ground colour, and the absence of the small black markings were apparently sufficient to attract the leery eyes of the prowling Corvidæ. I have found a wild duck and a short-eared owl nesting within a few yards of one another : whence is the necessity for the great difference between the procreant cradles of these two ground builders ? True, the species are widely divided, and their whole domestic economy is different, but here we see that the warmth and depth of a bird's nest is not always dependent either upon the state of the young when hatched or upon the duration of time they subsequently remain in the nest, for the offspring of the former are nidifugous, those of the latter nidicolous. Nor is the concealment of the duck's eggs by her down when she leaves the nest necessitated by the greater conspicuousness of her eggs, for the pure white eggs of the owl are far more visible at a distance. What, then, is the utility of the down-covering, and how is it that this species of owl still exists, in spite of its laying a white egg in an open nest ? The owls are night-feeders, and the male bird also feeds the female on the nest by day, so that she can conceal her eggs and retain her feathers on her breast whilst doing so ; whereas the mallard does not thus attend to the wants of his spouse, but she is obliged to cater for herself and to seek her food at some distance from her eggs, and that frequently whilst swimming or paddling in the water. The down-covering, therefore, assists in retaining the warmth of the eggs whilst she is away, and also lessens the chance of their being chilled on her return from contact with her wet plumage.

In his grand work on the surface-feeding ducks J. G. Millais mentions having frequently found nests of the mallard, when placed near the water, unfilled with down ; one can only imagine that frequent robbing of the eggs, and the consequent building of extra nests resulted in a deficiency of down to line them with, as the eider duck "farmers" have found to be the case. Such a departure from the ordinary methods of the former species was personally unknown to me, in a state of wild nature, after incubation had once commenced, until, within a week of my reading Mr. Millais' experiences, I came across a nest of the wild duck which was placed much nearer to the water than is the local custom of this bird; it was practically downless, and also contained much more material and lining, in the shape of dead vegetation, than is usual. This incident shows how dangerous it is to call in question the observations of others. I have seen hundreds of wild ducks' nests, and perhaps scores of those of the shoveller, but never until 29th April 1903 had I ever found one of either species without the "doom," as we call it.

That some amount of moisture helps the embryo chick in escaping from the shell when hatching approaches, especially in the case of eggs with hard shells and tough internal membrane, we know from practical experience with domestic poultry. Thus hens' eggs "come off" better when their nests are placed upon the ground than when they are "set" in raised boxes. Tame ducklings, too, when incubated by a hen, are the stronger and better for it if the shells containing them in embryo are now and then sprinkled with tepid water. This need for a certain amount of moisture may be the *raison d'être* for the *green* vegetation frequently found in the nests of arboreal building hawks and of cormorants breeding inland, the moisture evaporating from this greenery, minute in quantity though it apparently be, may nevertheless be sufficient to serve a needful purpose.

In *The Great Mountains and Forests of South America*, Mr. P. Fountain, after bringing forward supposed instances from personal observation, comes to the conclusion that the doctrine of protective coloration is based on erroneous grounds. Nature's idea, he says, is to create a pleasing and curious variety to gratify the eye of man, nothing more. This is a retrograde step in science, and one need not go to desolate regions, pathless prairies, and trackless forests where there are no eyes of man to behold the wonders and beauties of protective mimicry, to see that nature's endless variety of form and colour needs some more comprehensive explanation. In our own country how few human eyes have ever been gladdened by the infinite variety displayed by the shapes and markings of the pollen grains of plants, their seeds, and the eggs of insects. True, nature still, as in the days of Moses, discloses her beautiful marvels more and more to those who will take the trouble to turn aside to see; but there is, indeed, a great waste in nature, if she has for countless ages been building up these present-day diversities of tint and shape to gratify the eyes of those few twentieth-century men and women only who possess a "student's" microscope and know how to use it.

Reptile Studies.

By Gerald Leighton, M.D., F.R.S.E.

IX. British Lizards.

In the minds of many people lizards are only one degree less repulsive than snakes, and, indeed, the curse of the serpent seems to have involved the whole class of reptiles more or less. On the other hand, however, just as a good many naturalists find the observation of snakes a most fascinating study, an even larger number have admitted the lizards to a place in their esteem. It is only necessary to examine the animal contents of a dealer's shop, or the headings of a catalogue, to ascertain that there must be a considerable demand for lizards as pets in the vivarium, and as the majority take extremely well to life in captivity and are quite harmless, the explanation is not far to seek. The majority of the lizards thus kept, however, are not, strictly speaking, British species, unless we include under that heading the Green lizard (*Lacerta viridis*) of the Channel Islands and the Continent. This is a very favourite species for the vivarium, and is one of the most beautiful of lizards in colour and grace of movement. Those who wish to know all about the methods of treatment for these reptiles in captivity, and which species are best adapted for that purpose, should consult the work by Rev. Gregory Bateman (*The Vivarium*), whom our readers know as a contributor to these columns. The further life-history of

British lizards forms the subject of a book by the present writer which is now in the press, and from which the two illustrations to this article are taken. These photographs and a large number of others from the same gifted photographer, Mr. Douglas English, will appear in that volume, and they throw excellent light on the creatures represented.

As a preliminary to the further study of our indigenous lizards I wish in this paper to indicate merely the lines upon which such a study must be based, and to note especially the reasons for including certain species in the list; and, secondly, to draw attention to some points connected with the geographical distribution as far as these Islands are concerned.

In some of the popular works on natural history in this country it will be found that the Green lizard is described as an indigenous species for the south of England, or else it is simply stated that the question of its right to be included in the British list is undecided, and that therefore a description of the lizard is included in the book. Others ignore it altogether. Neither of these two attitudes seems to me quite satisfactory. Before the systematist is able to draw up a complete faunal list for any country, the very first thing that is essential is to be quite clear as to the boundary lines of the area to be dealt with. These lines must be hard and fast, in order that the student of the fauna may know exactly what is meant by the name given to the area included. At first sight it would appear that there would not be any chance of confusion arising in the case of Great Britain, or any other island or collection of islands. As a matter of fact, however, it is precisely upon this point that the question hinges as far as our lizards are concerned. It simply comes to this—Are we to consider the Channel Islands as part of Great Britain for purposes of zoological distribution, or are they to be left out of consideration? According to the answer given to that question will the reptile list differ. I wish to lay great stress upon this matter. It cannot be too clearly recognised that the Green lizard (*L. viridis*) has no claim to be included in the fauna of this country unless the Channel Islands are regarded as one division of the country for purposes of zoological classification. The isolated reports of captures of this lizard in the south of England, which have appeared from time to time, are doubtless the results of the escape from captivity of specimens brought from the Channel Islands or from the Continent, whence they have been imported for many years in considerable numbers. It is probable that the well-known reference to this species which occurs in Gilbert White's *Natural History of Selborne* was responsible for the belief gaining credence that this lizard was found occasionally in some southern localities. Be that as it may, the fact remains that the Green lizard is not, and never has been, truly indigenous on the mainland of this country, and its claims to inclusion in the list of British lizards must rest upon a scheme of geographical distribution which includes the Channel Islands as a part of Great Britain. It so happens that a few years ago a scheme of this sort was drawn up after consultation with many zoologists in the country, in which the whole of Great Britain was divided up into provinces for faunal descriptive purposes. The boundaries of the various provinces are not those of the administrative authorities, which, of course, are often artificial boundaries in the case of counties, but are laid down on natural lines, mountains, rivers, and so forth. In this scheme the Channel Islands form Province I. of Great Britain, and any faunal list which takes the plan as its guide must therefore include the animals found there. Those of my readers who happen to have read the description of the distribution of the snakes of this country in my book on that subject, will remember that in that case I followed out the distribution on the lines of this scheme, and described it as found in the various provinces. I propose to do the same thing in the case of the lizards; and, therefore, the Green lizard of the Channel Islands finds a place. It also follows that another lizard found there, namely, the Wall lizard (*L. muralis*), must be likewise included.

We thus see that the complete list of British lizards, including those found in the Channel Islands, is as follows:—

COMMON LIZARD (MALE).

Photos by Douglas English.

COMMON LIZARD (FEMALE).

The Slow-worm (*Anguis fragilis*).
The Common lizard (*L. vivipara*).
The Sand lizard (*L. agilis*).
The Green lizard (*L. viridis*).
The Wall lizard (*L. muralis*).

Whether it is well to thus include the Channel Islands in Great Britain for zoological purposes or not is of minor importance. The great thing to be clear upon is that the inclusion of the two last-named species depends simply upon whether the inclusion is decided upon or not.

The distribution of the three lizards of the mainland is very various. Perhaps the most evenly distributed is the little Common viviparous lizard, which is the only reptile found in Ireland. In my own experience I have found this species scattered all over the country in suitable spots, and I have not observed very much difference in its frequency in such widely differing localities as Dorset, Norfolk, and Inverness-shire in the north of Scotland. In some counties, however, it is distinctly rare, very few comparatively being observed in Herefordshire. It has often been reported in mistake for the Sand lizard, especially from Scotland, but a careful examination of the two side by side will enable the field naturalist to avoid mistaking them. The Slow-worm, our limbless lizard, is also widely distributed, but is absent from Ireland, whilst it is very local in its occurrence in many counties. In some places in South Wales it is extremely numerous, and in most counties can be found without much difficulty if the right spots are searched at the right time.

It gets somewhat rare as one goes farther north, in comparison, that is, with more southern localities; and in a fortnight of reptile hunting in the Highlands near Inverness, I found only one single specimen. In that particular district the Common lizard was fairly plentiful, and the adder very numerous.

Lastly, as regards the Sand lizard (*L. agilis*), it has to be noted that the distribution of this species is peculiarly restricted. As a matter of fact it is practically restricted to a few localities in Dorset, Hampshire, and Surrey. In the latter county the district of Farnham seems to be specially favoured. This lizard is of interest to the student of British reptiles, inasmuch as it forms the favourite article of diet of the rare Smooth snake (*Coronella austriaca*), which is therefore found in the same localities. Mr. Douglas English's photos represent both the male and the female of this species. Southport, in Lancashire, is also described as a habitat of the Sand lizard, but with the exception of these places its occurrence is very problematical.

The order Lacertilia or Lizards is one of great interest, especially when considered in relation to that of the Ophidia or Serpents. It is a very large order in numbers, and yet does not contain a single poisonous species, with the doubtful exception of the Mexican Heloderm. It contains members resembling snakes in so far as they lack limbs, but resembling the true lizards in the arrangements of the jaws. It was in this order that the existence of the rudimentary median eye was first described in reptiles, an organ which to this day reaches a fairly high development in that extraordinary creature the New Zealand Sphenodon, sole living representative of an extinct group. It includes oviparous and viviparous species, ground species, and arboreal types, and amongst the many other problems of the group is that of the wonderful range of colour variation possessed by some of its members. Some of these matters have been already mentioned in these pages, and we hope to return to some of the others at a future date.

Colour in Fishes.

By F. G. Aflalo, F.R.G.S.

It was while watching an unceasingly active shoal of herrings and mackerel the other day in the Brighton Aquarium that I was inspired with the subject of my contribution to this number of the *F. N. Q.*, for the brilliant blue and silver colouring of these surface-swimming fishes contrasted with the dull, sandy-hued upper surface of the plaice and dab with striking effect. Colour protection has been closely studied in the birds, beasts, and reptiles; yet I venture to suggest that its most obvious appeal to the appreciating eye is made in the world of fishes. Occasionally, indeed, it has seemed to me that the doctrines of colour protection are a little strained by those who interpret nature in her varying solicitude for her children's welfare. How, for instance, the large brown egg of the cuckoo can be regarded as helped by its coloration when lying in a nest of green moss along with the small blue eggs of the hedge-sparrow, I never understood.

The fishes offer no such anomalies. Those which, like the cods and flat fishes, swim low against a background of, for the most part, sand or shingle are dull coloured above, and it takes a practised eye to distinguish a plaice, even with the additional assistance afforded by its red spots, lying motionless in even two or three feet of water. Often enough, when the spearer wades after his prey, it is only the sudden movement of the latter, disturbed by his advancing feet, that betrays it to the enemy. If the plaice had only the useful inspiration to lie still, it would in most cases go unharmed.

With shoaling fishes, like the herring and mackerel, the needs are as different as their mode of life. These swim close to the surface. Their most dreaded enemies, the hake and dogfish, are on the prowl beneath them. Consequently, their victims are between them and the light. What is more likely to enable them to pass on their way unseen than the silvery coat which nature has given them for the purpose? Even the bars on the mackerel assimilate wonderfully with the lights and shadows in the surface waters.

With the larger fishes, it is true, such as the huge sharks, which have little to fear from natural enemies, there is evidence of carelessness in this matter of colouring, and so we find some of the dogfishes fearlessly swimming abroad in spotted uniforms that recall the leopard of the dry land.

Others again, such as the gorgeous wrasses, are not palatable to a number of carnivorous fishes that prey readily on other kinds, and these can therefore afford to wear coats of many colours. Even so, however, it is remarkable to what an extent bright colouring is softened and modified and toned down in the water. How brilliant a fish, seen on the foreshore as the tide recedes, is the male lump-sucker, or "cock-paidle," as they call him on the Scotch coast; yet how dull a couple looked in the Brighton tanks when last I saw them! Nature has not yet given ichthyologists a silvery flatfish; or rather, one ought perhaps to say, man has not yet succeeded in bringing such a fish to light in his trawls or deep-sea dredges. One of these days, perhaps, we shall be confronted with one, and then it will soon be no more of a wonder than the black swan.

Colour-changes in living fishes are not common, though every angler knows how soon the delicate tints fade after death. Indeed, in the case of the red mullet, the bright red colour is not only preserved for market purposes, but is even intensified by the prompt removal of the outer scales after capture. There is, it is true, a native of South American streams known as the "Chameleon Fish," but whether there is any analogy between its habits in this respect and those of the reptile from which it takes its name, I am not sufficiently acquainted with the fishes of that region to say, nor have I been able to find any information on the subject in Dr. Federico Delfin's compact *Catalogo de los Peces de Chile*, the latest brochure on the fishes of that part of the world.

It has often been pointed out that the fishes of tropical and subtropical seas are on the whole far brighter than our own. As the fisherman goes south, indeed, he meets with increasingly bright-hued spoil. I was struck almost on my first outing with the brilliancy of such Australians as the sergeant baker, the nannygai, and the snapper. Even in the Mediterranean I have caught breams and wrasses far more smartly dressed than those on our own shores. It must, however, be borne in mind that the sun shines more brightly overhead, the sky remains longer free of clouds, in those countries, and consequently the bright raiment may in itself, with such a background (again, remember that the natural enemies of fishes are other fishes, and that their standpoint is not that of a fisherman standing on the shore or in a boat), afford greater protection than if the fishes were dull brown or black.

I have, so far, written only of sea-fish, for the simple reason that my acquaintance with them is considerably more intimate than with those of fresh water, but there is little difficulty in showing, even with an only superficial knowledge of the latter, that the same rule applies. The spotted trout is safe against a background of gravel in running water, as the duller bream and carp are eminently suited to an environment of mud and reeds. Any comparison, however, of the degrees in which colour protection works out in salt water and fresh, must necessarily be based on a proper appreciation of, and allowance for, the very different depths that obtain. Although practically the entire sea-bed which comes within the operations of the longshore fisherman lies in the sun's influence, there are greater depths of equal, perhaps of greater, interest to the naturalist, which are far beneath the light of day. In such situations the problem of colour protection obviously becomes reduced to its minimum importance, though other factors, which need not here detain us, may there come into operation. As regards our river fish, their life is clearly passed in the light zone, and, indeed, colour protection is in one sense of yet greater importance to them than to their brethren of the salt, though in another, seeing that their natural enemies are somewhat fewer, it may be less so.

The question of colour as seen in the water has another and distinct interest for the fly-fisherman, who has to discuss the sensibility of salmon or trout to the colours of flies thrown from above and therefore seen by them against a background of sky; but this is perhaps a little wide of the present subject. All that I have endeavoured to accomplish, in a short space, is to show some measure of scheme in the coloration of a most interesting group of animals peculiarly adapted to existence under water.

Reappearance of the Smooth Snake in Berkshire.

By G. E. Blundell, *Wellington College.*

In Dr. Leighton's book on British Serpents, a letter is quoted from Mr. J. L. Bevir, of Wellington College, Berks, in which the latter states that he remembers the time when *Coronella austriaca* (the smooth snake) was not uncommon in this locality; and further states that no less than five specimens were brought to him in one summer. Mr. Bevir goes on to say that no specimens have been taken in the district for many years, and he fears that this interesting snake is now extinct in Berks. However, as the result of a lecture on indigenous snakes, given by the editor of this Journal to the Natural History Society at Wellington College, the boys have given more attention to the reptiles than they did formerly, and the latest discovery has been a fine specimen of this very species. Curiously enough, Dr. Leighton almost prophesied this event, both in his book and in his lecture. He accounts for the rarity of this species partly from its being so like the adder that it is destroyed in mistake for it, and never recorded; and partly because it has never been seriously looked for in some localities in the south of England. When at Wellington College he said that he should be quite prepared to find that the smooth snake still existed amongst the heather, and that careful search would reveal it.

On 18th June 1903 a specimen of *C. austriaca*, the smooth snake of Dorset, Hants, and Surrey, was found in the heather near the school rifle-range at Wellington College, Berks, by R. H. A. Morshead. Its total length when brought to me was 21½ inches, the tail being 3¾ inches. From comparison with other species, I believe it is a male, but upon this point I am not certain. In colour it is a a greyish green, with brownish blotches along the sides, most distinct near the neck; and when placed in the heather it is extremely difficult to see, especially as it usually hides the whole of its body, only peering out with the head slightly raised. In rough heathery ground it moves fairly rapidly, but on open gravel or sand it appears almost helpless, groping vainly for some holdfast for its tail. The latter organ appears to be peculiarly sensitive, for although this specimen does not in the least resent handling, it invariably moves off rapidly when its tail is touched. Its habit of hanging on by the tail is illustrated in one of the photographs that have been taken of it.

The snake has only bitten me twice, though frequently handled,—in each case merely a gentle pinch. The teeth do not appear large enough to draw blood. When given small frogs, bluebottle flies, and bees, it took no notice whatever, but seemed interested in a small lizard, which, however, it ate only after they had been two days together.

The Coronella always strikes sideways, bending its neck at almost a right angle. The introduction of a large lizard led to a fight, the lizard seizing the smooth snake by the lower jaw; but after a long tussle the snake succeeded in swallowing the lizard as far as the tail, only to reject the lizard later, apparently none the worse.

The smooth snake is at present sloughing. The process began at the eye scale, then some three days later the belly scales began to peel off irregularly.

[We hope to reproduce the most interesting photographs sent by Mr. Blundell in a future issue. The reoccurrence of the smooth snake in Berks is an event of great interest to zoologists.—Ed. *F. N. Q.*]

Our Common Wild Birds, and How to know Them: An Attempt to help the Young Ornithologist.

By W. Gyngell, *Scarborough Field Naturalists' Society.*

The experienced ornithologist readily identifies the commoner birds which he sees in the woods or fields, by the riverside or the seashore: this one by its size, colour, and markings, that one by its mode of flight, another by its running or hopping on the ground; by call-notes or song, and whether the song is sung in the air, the hedge, or a tree, and, indeed, by all these and many other ways.

The object of this paper is to help the novice; consequently it will not be supposed that the reader has the slightest knowledge of bird life, so we begin with the House-Sparrow (*Passer domesticus*). On the roof of the house, or feeding amongst the street refuse, we often see a little bird of the size of a cage canary, more or less dirty brown in colour. When on the housetops he calls "chur-chur" to his mates, and this is all most people know about him. We begin our lesson in ornithology by taking a *real look* at our first bird, when we shall see that he and his companions vary in brightness and cleanliness, and that some of them are chestnut-coloured and black on the sides of the head, have grey cheeks and black throats. These are the cock birds. The hens are duller. To notice that the sparrow is more than a dingy brown bird is to learn something.

The Tree-Sparrow (*P. montanus*) had better be left over until more experience has been gained, and then, by careful observation, we shall distinguish this shyer and less common bird by the *whole crown* of its head being *chocolate-coloured*, and its having a V-shaped white mark enclosing a black centre on each cheek.

The Hedge-Sparrow (*Accentor modularis*), though not related to the above two species, may be taken next. We shall very soon notice it hopping about on our lawn or garden beds, a bird of quieter and, one might almost say, more ladylike habits than the house-sparrow. It is a tame, confiding little creature, allowing sufficiently close approach for us to see its only readily distinguishing features. Its head is bluish grey, its beak longer and thinner than the common sparrow's, and it has a habit of shuffling its wings up and down as it moves about. It loves the neighbourhood of hedges and bushes, and its call-note, a sharp "keek-keek-keek," also helps identification.

The Robin Redbreast (*Erithacus rubecula*), most loved of all wild birds, is one of the very first to come under our notice. About the size of a sparrow, he is the only bird with an *orange*-red breast that we shall see in our town gardens. His perky familiarity, habit of ducking his head, and singing a steady sentimental sort of song in garden trees at all times of the year, will also help to make his identity certain. His red breast is the only striking feature in plumage, for his other parts are greyish brown.

The Chaffinch (*Fringilla cœlebs*), another bird of sparrow size, will soon be noticed in garden trees and paths, and his ringing call-note, "chink, chink," soon heard. A handsome bird is the cock, and although he has a *reddish-brown breast*, we shall not confound him with the robin, whose breast is bright *orange*-red. The conspicuous *white bar* across the chaffinch's black wings also enable us readily to distinguish the bird, whose head is bluish grey and back reddish brown. The soft beauty of these blended colours is sure to attract us. The female chaffinch being yellowish brown above and yellowish grey below, it is only the *white band across the wings* which will serve to distinguish *her*.

The Bullfinch (*Pyrrhula europæa*), another bird of robin's size, also with a red breast, we may often see when we get a little way out into the country, in sheltered and secluded places. Occasionally we may see it in gardens and shrubberies near town. The striking contrasts of its general colour enable us to identify it at once. The breast of the cock bird is a *bright brick red*, the head, wings, and tail deep blue-black, and when it flits away along the hedgerow or through the copse the *pure white rump* is very conspicuous. The hen bird differs in having a brown breast, but the patch of pure white generally betrays her identity.

The Greenfinch (*Ligurinus chloris*) is a shade larger than a sparrow, and may often be seen about gardens and hedgerows near town. Its *general colour* is *yellowish green*, more or less bright according to sex and condition. But it is the *only* common small bird that is *green*, and this is the distinguishing characteristic.

The Common Linnet (*Acanthis cannabina*) is that little brown bird, *less than a sparrow*, which we so often see confined in the tiniest of cages and hung against a house wall. Generally speaking, this little bird is all brown, but we sometimes see him adorned with rose-red breast and crown. As the poor little fellow jumps from side to side of his tiny prison, he sings a quiet little chirruping song, "pretty-pretty-pitchup, chee-chee, pretty-pretty." By noting the song when we hear the bird in its cage we learn to know him when seen in little flocks in the fields or nesting amongst the furze bushes.

The Lesser Redpoll (*A. rufescens*), common in some parts of the country, is still smaller than the linnet, and more often has the crimson breast and crown. Its *black throat* helps us to distinguish the bird, which has a very different song to the linnet; feebler, less varied, and very often sung on the wing, in a jerky way—"zizzy-ziz-*ee*, zizzy-ziz-*ee*." It keeps amongst the upper branches of trees much more than the linnet.

The Yellow-Hammer (*Emberiza citrinella*) is conspicuous in being the only common perching bird whose most noticeable colour is the *bright yellow* which adorns its *head and under parts*, causing the novice sometimes to fancy that it is an escaped canary. And if the bird's appearance were less striking one would soon be attracted by its song, which bears a fanciful resemblance to the words "little bit o' bread and *no* cheese."

The Corn-Bunting (*E. miliaria*) is just a size larger than a sparrow, and even duller in plumage. It *haunts corn and pasture fields*, especially near the coast, and spends most of its leisure time in singing a monotonous drizzle of a song from the top of a hedge or bush, "tuck-tuck-ting-ting, tidder-idder-*eeeee-e*." By its haunts and habits it may be most easily identified, and often also by the peculiar way it allows its legs to hang down when it leaves its perch.

The Reed-Bunting (*E. schœniclus*) is another bird of the size of the yellow-hammer, and although much less common it may often be seen by reedy river banks or marshy ground. It is the black-headed bunting of the older books. It may readily be known by its *black head relieved by a white collar* and moustache-like mark below, black throat and breast. As this is the only black-headed bird that one usually sees about its haunts, it is not easily confounded with any other.

The Swallow (*Hirundo rustica*) is *one of* those birds of sparrow size which in the summer months we notice all day long rapidly flying up and down the streets, along the face of the houses or over the fields, sometimes skimming along close to the ground, rapidly twisting and turning about in everlasting pursuit of flies. Two or three different species of birds addicted to this habit will sure to be noticed, and they are all swallows to the careless observer. But a near view of the true swallow soon reveals its "points." The outside feathers of its *forked tail* are *prolonged into streamers.* The general appearance of the bird when on the wing is bluish black, but a near view of the bird, say, as it sits twittering upon the telegraph wires, shows us the light-coloured under parts and chestnut-red forehead and throat.

The Martin (*Chelidon urbica*) is the bird most likely to be confounded with the swallow, especially if we rely upon our friends for information about birds. It is the martin and not the swallow that builds its nest of mud under the eaves of houses. (The swallow usually nests *inside* buildings.) It also has a forked tail, but *without* the long streamer feathers, and as it flits up and down over the street, or skims the surface of pond or river, its most noticeable characteristic is the *brilliant white rump* which, in contrast with the otherwise black plumage, is so conspicuous in flight that the bird, seen from above or on a level with the eye, *looks like a moving white spot.* The sharp call-note "fritz" is quite different to the "chillip" of the swallow.

The Sand-Martin (*Cotile riparia*) is the smallest of the birds commonly called swallows, and as it chiefly haunts sandy cliffs and river banks, where it burrows its nest holes, it is easily identified by these habits, its *smaller size*, and *brown* colour.

The Swift (*Cypselus apus*) is much larger than either of the three last birds, and although not related to the swallow family, superficially it is much like one of them. Very long pointed, curved wings give this bird a crescent form as it alternately sails through the air or rapidly vibrates its wings in flight. It has been well described as resembling, when on the wing, a bent bow with the arrow in position. It often flies at great heights, and associating in small flocks delights to wheel around tall buildings uttering its shrill scream, "squee-squee, squee-squee." None of the swallows does this.

The Spotted Flycatcher (*Muscicapa grisola*). When spring is well advanced we may look for this little bird wherever there are large trees, in town or country. This is another of those little brown birds of the sparrow size which seems to be the most successful in the bird world. In this case, however, the brown colour of the head and the dull white under parts are relieved by streaks of a darker colour, which gives the birds a somewhat spotted appearance when closely observed. But the bird's habits, and not the colour, will first attract our attention. Leaving its perch—the park railings or a tree-branch—it flits out over the road or field, dodges round in the air, catches a fly, and goes back again to the same or another perch. And by this regular and almost unique habit we know this familiar bird.

The Pied Wagtail (*Motacilla lugubris*) is a little *black and white bird with a long tail*, and here again habitat helps us to identify. By ponds and streams, in roads or fields, or in farmyards amongst the cattle, this little bird *runs* about, *instead of hopping*. His movements are very lively, as with *constantly vibrating long tail* he darts about after flies, or runs after them on the ground and everywhere. He is easily distinguished from all other common British birds.

The Grey Wagtail (*M. melanope*) is even more beautiful than the last, and its habits are almost similar, but to call it grey is misleading, for it is only the upper parts of the bird which are this colour. The *chin and throat are black*, the *breast and belly bright yellow*, and the yellow parts are most conspicuous in flight. The bird is thus a *yellow* wagtail to the casual observer. But this is not a common species, except by mountain streams in the north and west, where it delights to dwell by the side of rapid running streams. All the wagtails, but especially the last two, are easily identified on the wing by their habit of flying in a succession of jerks, calling as they fly, "chis*sick*, chis*sick*" (with the stress on the last syllable).

The Yellow Wagtail (*M. raii*), which in habits is more like the meadow-pipit, takes the place of the grey wagtail in low-lying, flat meadow lands. It has a much shorter tail, its *upper parts are greenish yellow*, and the *whole* of the under parts, as well as the throat, are yellow.

The Meadow-Pipit (*Anthus pratensis*) and the following species are nearly related to the wagtails, and belong to a family of birds which naturalists call pipits and other people call titlarks. About the size of a sparrow, light brown in colour, with no characteristic markings but the speckled breast, they look like little larks. The present species inhabits the *open* country almost everywhere, from the shore to the highest moors. We may see one or two running before us as we cross a meadow, a furze-clad heath, or the rock-strewn beach. They flit before us calling, "peep-peep-peep-peep." On the wildest moors no other small bird may be about, but the call of the meadow-pipit is almost sure to be heard. In happy moments they rise into the air a *very little like the lark*, very soon indeed to descend, singing the while, "wit-wit-wit-wit-wit-wit," more quickly uttered to the end of the song.

The Tree-Pipit (*A. trivialis*), a summer visitor only, is a much more interesting bird. As the two species are identical to the unpractised eye, it is fortunate for the young observer that they differ much in habits. The tree-pipit haunts the neighbourhood of trees and especially woods, *perches upon trees* and *sings in trees*, and these are very uncommon traits of the meadow-pipit. The song of the tree-pipit is delightful; free, varied, and much resembling the notes of a canary. It has the remarkable habit of singing at the top of a tall tree, whence it often rises slowly into the air, singing all the time, takes a curve round and slowly descends with outspread wings, singing still, to the same or a neighbouring tree.

The Skylark (*Alauda arvensis*) needs little introduction, and one only need say that it is rather larger than a sparrow, and the only bird which rises from the fields and soars steadily high into the air, singing all the time its loud, varied, and most cheering song. It often remains suspended in the air for many minutes, then slowly descends again, finally dropping like a stone to the earth, only recovering again just for an instant before it finally alights. On midsummer day this year the writer heard it at 1.51 A.M.

A number of small birds of sparrow size and smaller are commonly known as warblers,—a few, like the robin and hedge-sparrow, are with us all the year round,—but as members of this family feed chiefly on insects, most of them are only summer visitors to England.

The Wheatear (*Saxicola œnanthe*) is amongst the first to come and take up its abode on sea-cliffs, rabbit warrens, or bare hillsides. It is the biggest of this group of birds, being rather larger than a sparrow. A nervous bird, flitting away across the fields directly it is disturbed, *showing a lot of white about the rump, tail, and under parts*, being black on the wings and face. We know the wheatear by these tokens, and, as is the case with so many birds, by its haunts.

The Whinchat (*Pratincola rubetra*), a nearly related bird, frequents less barren ground. Another summer visitor, common by roadside, waste lands, rough pastures, and hilly fields covered with furze. He sits on a fence or hedge-top, and keeps calling out, "*u*-tick, *u*-tick, *u*-tick, tick." Then he moves across the road, balances himself upon the top of something else, and "*u*-ticks" again. We can get near enough to see that he is of sparrow size, mottled above with dark brown, and having a *long white streak over the eye*, and another white mark across the lower part of the face. More white on the tail, and the lower parts buff. But that call-note "*u*-tick" is unmistakable.

The Stonechat (*P. rubicola*) is a bird of similar size and habits to the last, but not so often found in the meadows, preferring wilder and more open country. Where one bird is found, the other is usually absent. This is a much more handsome bird, having a *black head, partial white collar*, but *no white eye streak*, and a *bright reddish-brown breast.* It may be seen in winter as well as summer.

The Redstart (*Ruticilla phœnicurus*) is a conspicuously handsome summer visitor, common in many parts of the country, and especially noticeable by its chestnut *red tail*, black face and chin, and *white forehead.* As the wagtails flirt their tails up and down, so the redstart shivers his red tail *from side to side*. There is no mistaking the male redstart. The bird frequents woods and gardens.

The Nightingale (*Daulias luscinia*), about which everybody seems to know one thing only—that it sings by night,—is not uncommon in most southern counties, and to the writer its loud, rich, varied, and free song, which may be heard at all hours of the *day* and night, is far superior to that of any other British bird. Of unpretentious pure brown plumage, there is little by which to identify it, except that in a good light one can see that the bird's *tail is more red than brown*. When the songs of the other warblers are well known to the young naturalist, he will then have no difficulty in identifying the nightingale, which one may look and listen for in hazel coppices and thick, low-lying hedgerows.

The Blackcap (*Sylvia atricapilla*), another summer bird of the woods, also of sparrow size, may be known by its being the only grey bird having *only the top* of the head black. (Please note that there are several small birds with black *heads*. This one has only a black *cap*.) It sings very beautifully, but we have no space in this article for poetic description. The lady blackcap is like her spouse, except that she wears a cap of chocolate colour.

The Whitethroat (*S. cinerea*) is one of the very commonest of summer visitors, is a shade smaller than a sparrow, light brown in colour, darker on the face, and with a *white throat*, which becomes conspicuous when the bird sings, in a low hedge or amongst roadside brambles, which are its favourite haunts. The whitethroat also has a common habit of shooting out of the hedge and up into the air for a yard or two, at the same time singing its snatch of a song.

The Sedge-Warbler (*Acrocephalus phragmitis*) haunts similar situations to the whitethroat, and is quite as common. It shows, however, more preference for the neighbourhood of water. Here, again, we have a little bird less than a sparrow, of *reddish-brown* plumage above, and of buffish colour below, the best distinctive feature being a conspicuous *light line over the eye*. The sedge-warbler seems never to cease singing *night or day* if there is any creature near to hear it. A loud, varied, scolding song, rapidly performed—"chow, chow, chow, chee-chee-chiddy-iddy-chur-chur," followed by notes borrowed from half a dozen other birds. Because it sings at night it is commonly mistaken for the nightingale by those who have no acquaintance with the song of the latter.

The Grasshopper Warbler (*Locustella nævia*), not uncommon in many districts, is about the size of the latter, and the young naturalist should not trouble to *look* for it. If it is about he will be sure to hear its most extraordinary song, which sounds most like the noise produced by a very weak pea whistle, by an angler's reel when running out, the wind through a single telegraph-wire, or the "note" of a large grasshopper long continued. Heard in a quiet country lane late in the evening, or even at midnight, it is very impressive and impossible to mistake.

The Wren (*Troglodytes parvulus*), though erroneously described in the story-books as *the* smallest of birds, is certainly very diminutive, and less than any of the birds previously referred to. This little favourite, which often comes into town gardens, is of a *rich brown colour*, with narrow transverse *darker bars on its feathers*, which are not streaked down their length as those of so many birds are. It haunts hedge bottoms, tree stumps, brambles, etc., and usually keeps close to the ground. Moving about its haunts like a mouse it carries its *tail cocked straight up* over its back unlike any other bird. Its loud song is sung in quicker time than that of almost any other bird.

The Tree-Creeper (*Certhia familiaris*), which well deserves its common name, is not very much bigger than the last. It haunts chiefly thick woods of large trees, and spends all its working time climbing, more like a mouse than a bird, up the trunks of the trees. It ascends with jerky motion, flitting now and again from the upper part of one tree to the lower part of another in order to renew its upward course. Its general colour is reddish brown streaked with buff. It has a long curved beak and stiff pointed tail, which it keeps pressed against the tree to assist it in climbing. There is no mistaking it for anything else.

Two tiny little warblers, each only about the size of a wren, come to our island in spring-time, and spend most of their long days in singing or hunting for insect food *amongst the taller trees* of woods or hedgerows. Both these birds are light olive-green above, and of a dull whitish colour below, and they cannot be readily distinguished from each other out of the hand. However, their notes are quite different. One bird is the

Chiffchaff (*Phylloscopus rufus*), whose song is merely a monotonous repetition of its own name, varied sometimes by what sounds like "tell-tale-tit." The other is the

Willow-Wren (*P. trochilus*), which sings a soft, sweet song of varied notes, forming a set cadence which to our ear sounds like "chictry-*wee*-chur, chictry-*wee*-chur, chictry-*wee*-wee-chur-chur-chur," quicker towards the end. It is one of the very softest and sweetest of little bird songs.

The Wood-Wren (*P. sibilatrix*) is found only in thick woods of deciduous trees, and like the last two species *haunts their upper branches*. It is a somewhat *larger* and *more yellow* bird, and is best known by its song—"chick-chick-chick-chick-chir-r-r-r-r *e-eeee*," the first notes rather measured, the latter running off into a sort of shivering trill. It also has a very plaintive call-note, "wee, wee, wee," long drawn out.

The Golden-Crested Wren (*Regulus cristatus*) is the smallest European bird, and fairly common wherever there are *spruce* fir trees, that is those known to our little ones as Christmas trees. It is often in company with the various titmice to be next referred to, and like them ever busily seeking its insect food. In the trees, by its habits and its size it reminds one of a mouse more than a bird as it moves along a branch, showing no colour distinction until it turns head downwards and displays the golden crest. Again we know the bird by its voice. The call-note, like the faint squeak of a little mouse, and the very quiet but very quick song, which we *try* to represent in words, "chick-a-*wee*-chick-a-*wee*, chick-a-*wee-chur*." Bird songs are almost impossible to represent in words, but there is always a rhythm and a measure of time by which the song of each species may be distinguished.

The Blue Titmouse (*Parus cœruleus*) is the commonest species of another family whose members are all small. This one we may see in town gardens as well as about woods and parks. It is much smaller than a sparrow, and may be seen flitting about amongst tall trees, low hedges, the roof of our house or a street lamp-post, incessantly going through acrobatic performances and prying into every hole and corner for insect food. We see at once that it has a *lot of blue about its plumage*, with some black and white markings on head and throat, but the blue is so conspicuous that we notice nothing else. Indeed, it is the only little bird that is noticeably blue. Now it is by this perpetual restlessness that we know the titmice, and as soon as we know the blue tit we will take a walk into the wood, stand about under the trees, and we shall soon make the acquaintance of other members of this family. There are two more about the size of the blue tit, the coal titmouse (*P. ater*) and the marsh titmouse (*P. palustris*).

And these, unfortunately for the novice, are very much alike, and often associate together in small flocks in winter. They are both of greyish colour above and dull white below, have black heads and white cheeks, *but* the coal titmouse has also a *conspicuous white mark on the nape of the neck*. This is not present in the marsh titmouse, and thus we always know one species from the other, that is when these very restless little fellows will keep still long enough to allow us a full view.

The Long-Tailed Titmouse (*Acredula caudata*) may often be seen in company with other members of this very sociable family. It is even smaller than the last three species, but it has such a *very long tail* that it really seems to be a larger bird. They are generally to be seen in small parties of from six to ten. As they frequently take little flights from tree to tree, flying with an undulating movement, their long tails give them a sort of overbalanced appearance. They follow each other in single file a few seconds apart. The markings of the bird's plumage, chiefly black and white, are well defined, but, as in so many other little birds, their habitat, movements, and general appearance are the best guides to identify in the field. The most elegant of British birds' nests is made by this bird. It is oven-shaped, with a tiny hole near the top, is made of moss covered all over with lichens, and a veritable feather-bed inside.

The Great Titmouse (*P. Major*) is as common as nearly all the others, and *much larger*, being almost equal to a sparrow in size. We may hear it almost any day in woods, parks, or gardens, calling in a sharp metallic voice, "*ping*-chur, *ping*-chur, *ping*-chur." It is a handsome and familiar bird, with black head and throat, and a broad black band running down the breast and under parts. These black markings are also made more conspicuous by the contrast of the bird's white cheeks. Its back is yellowish olive. Less active in its movements than the smaller titmice, it is nevertheless a very busy bird.

Having perhaps dealt with a sufficient number of species for one paper, in which attention has only been given to the smaller common birds of our country, the larger species will be treated in a future article.

One weak point in these notes will probably be observed. Little or no attention has been given to a description of the difference in plumage between the male and female in those cases where the sexes are not alike. As, however, the female plumage is usually but a modification of that of the male, in a paper intended to be as elementary as possible it has perhaps been wise to leave the lady birds alone.

(*To be continued.*)

Our Present Knowledge of British Insects.

By Claude Morley, F.E.S., Etc.

In the November (1902) number of this Magazine I superficially summarised the six great Orders into which insects are primarily divided by modern entomologists, with a view to assisting the tyro in an arrangement of such heterogeneous material as he might be expected to have accumulated. It may be interesting here to pay some attention to the directions in which he may most advantageously pursue his studies, both to his own delight and the furtherance of entomology as an exact science. For so large is the subject, whether viewed systematically or economically, that no individual (as Oliver Wendell Holmes[1] so aptly puts it) can hope to grasp the whole in a single lifetime.

The great Orders of Insects above referred to each comprise a more or less numerous congregation of species, which are subdivided in sections and families according to their mutual affinities. The Orthoptera, or Grasshopper Order, in Britain is represented by only about forty species; the Hymenoptera, or Bee Order, on the other hand, is so numerous that the lowest computation of modern times is well over four thousand different kinds. Naturally it takes far more time and trouble to systematically arrange and satisfactorily tabulate a great group like the latter than a small one like the former. Hence the Orthoptera are quite thoroughly known, but no one can draw you up a complete synopsis of the latter for love nor money.

Unless your bump of originality be something lacking, you will not care to travel country that has already been mapped out by others before you, but rather you will wish to strike out into a *terra incognita* and break ground where no pioneer has forestalled you—to teach the world something, be it never so little, of which it was previously ignorant.

With this end in view we can at once eliminate from our studies a great deal of the subject. The British Lepidoptera, Coleoptera, Heteroptera, and, as I have just said, Orthoptera, are so fully investigated that the discovery of a single kind, not previously known to inhabit our islands, raises something of a furore in scientific circles. We still, however, have left the Diptera, Hymenoptera, most of the Hemiptera, Neuroptera, and those curious and anomalous families of insects which have at various periods been placed in different systematic positions. With regard to the Diptera our knowledge of the kinds which are found with us is fairly complete, and we have a capital list of them,[1] in which the author points out that it is mainly of the gnat families of the Cecidomyidæ and Mycetophilidæ that we are ignorant. The Hymenoptera are less advanced; for although some sections, such as the Aculeata (including the Chrysididæ) and, to a less degree, the Braconidæ, Tenthredinidæ, and a part of the Cynipidæ, are fully known,[2] our indigenous Evaniidæ, Ichneumonidæ, and Proctotrypidæ have advanced little since the publication by the Entomological Society of synonymic catalogues by Rev. T. A. Marshall in 1872 and 1873, which are now become obsolete. The most neglected of all the Hymenoptera, however, are the Chalcididæ, for of them we are hopelessly ignorant, possessing practically nothing in the way of literature—Francis Walker's *Monographia Chalciditum* of 1839 being a frightful monument of love's labour lost, since it is utterly unintelligible to any but its author!

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[1] *The Poet at the Breakfast Table.*

Most of the remaining Hemiptera, which constitute the Sub-Order Homoptera, have been individually studied, though they receive very little attention from the general entomologist, who is usually satisfied with a collection of those kinds enumerated in James Edward's *Homoptera of the British Islands* of 1896. This work, however, contains only the Cicadina and Psyllina, commonly known as "frog-hoppers," and we have to thank the Ray Society for the publication in 1876–83 of G. Buckton's *Monograph of British Aphides* or plant lice, and quite recently Robert Newstead's fine work on the British Coccidæ or scale insects. There are still two groups of insects which have been considered as most closely related with the Hemiptera, to which special attention must be drawn, since so little is known respecting them that their very existence is generally overlooked; these are the Anoplura or lice, and the Thysanoptera or Physopoda, commonly called Thrips. My own knowledge is of the vaguest description regarding these specialised insects; those of the former group are, of course, often of the most repulsive habits, but this should be no excuse among scientists for omitting to study them—especially as the London Board Schools are said to be "capital" collecting ground! I am not aware that we have been given any standard work upon the subject since the appearance in 1842 of Henry Denny's *Monographia Anoplurorum Britanniæ*, to which the authorities in the British Museum referred when I carried them a hawk louse last year. In even worse plight are the Thysanoptera, for I cannot remember a single mention of them, excluding purely systematic works, except the few instanced as injurious to cereals in John Curtis' *Farm Insects* of 1860.

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[1] *A List of British Diptera*, by G. H. Verrall, F.E.S., 2nd ed., Cambridge, 1901.

[2] *The Hymenoptera Aculeata of the British Islands*, by Edward Saunders, F.R.S., London, 1896; *A Monograph of British Braconidæ*, by Rev. T. A. Marshall, M.A., F.E.S., published by the Entomological Society, 1885–98; "An Annotated Revision of the British Chrysididæ," by Rev. F. D. Morice, M.A., F.E.S. (*Ent. Mo. Mag.*, 1896); *A Monograph of the British Phytophagous Hymenoptera*, by P. Cameron, published by the Ray Society, 1882–90; etc.

The Neuroptera, but for two reasons, might be placed among our best known Orders, thanks mainly to Robert M'Lachlan, than whom no living entomologist, perhaps, has done more for the furtherance of the science. In the first place, the majority of systematists are agreed in including under this head a great and heterogeneous mass of insects; while, on the other hand, some (as Miall in 1902) regard this mass as constituting five distinct Orders in both the Hemimetabolic and Holometabolic divisions. Viewed as a whole, we have a good, though somewhat out of date, catalogue of the Neuroptera,[1] which, however, does not include those anomalous insects the silver fish and spring tails, known as Collembola and Thysanura. Nothing whatever was known of these curious creatures till the publication in 1873 of Lord Avebury's *Monograph* by the Ray Society. In it he enumerates sixty British species; but even now little attention is paid to the group, members of which are among our most abundant insects, and (I believe) but very little knowledge of our indigenous species has been added to that therein set forth.

From this superficial résumé it will be seen how very

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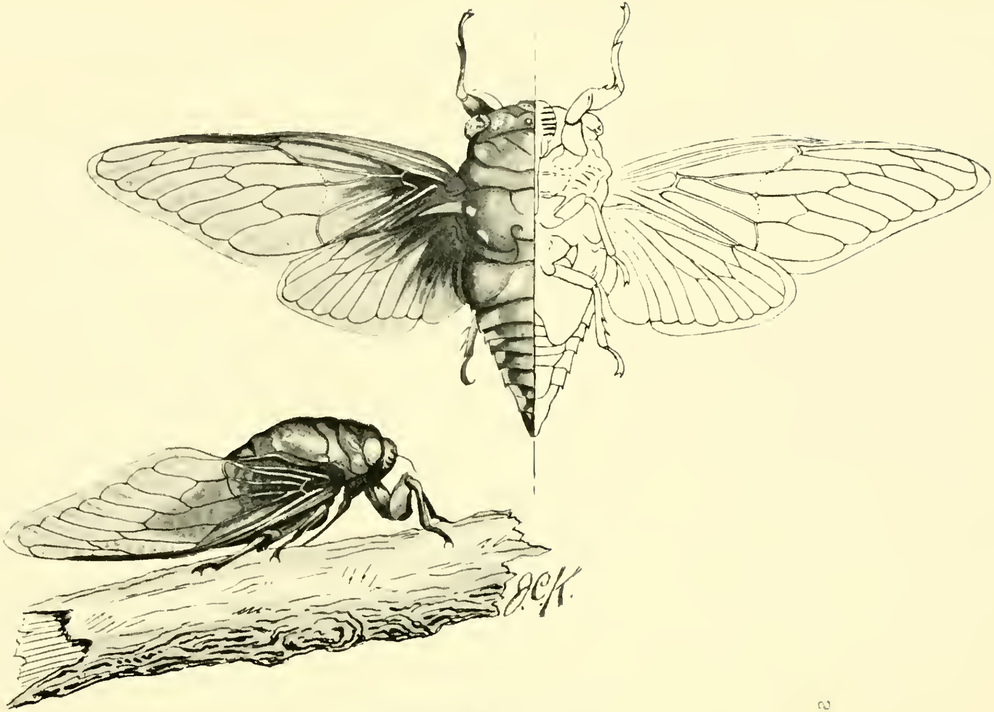
[1] *A Catalogue of British Neuroptera*, by Robert M'Lachlan, F.R.S., and Rev. A. E. Eaton, M.A., F.E.S., published by the Entomological Society, 1870.



CRYPTOTYMPANA RECTA.

much original work there is yet to be done; how comparatively little we still know in these "enlightened" days of the interesting organisms perpetually living their little life around us; and how far we still are from the possibility of compiling that Utopian *ultima thule*—actually attempted by Stephens, Curtis, and Wood—a complete and perfect catalogue of British insects.

A Naturalist's Notes from China.

By J. C. Kershaw, F.E.S.

1. A Characteristic Tropical Insect.

One of the first features of tropical and subtropical climates to strike the visitor, is the incessant stridulous noise made by insects of many genera, during the day chiefly by cicadæ, at night chiefly by crickets. In countries where there is little variation of temperature throughout the year, this insect orchestra performs uninterruptedly; but in the south of China there are three or four months of moderately cold weather during the winter or dry season, say from December to January inclusive, and in that period there is an almost total cessation of these sounds.

The family Cicadidæ may certainly take front rank amongst insects as noise-producers. Whether the stridulations act as a warning or intimidation to birds in general is open to doubt, as it is not uncommon to see bulbuls (*Otocompsa*) chasing them on the wing, probably in sport, as they never appear to capture them; but some bird certainly *do* attack cicadæ, as we have seen a black mynah (*Acridotheres cristatellus*) fly off with one of the large species in his bill, the insect meanwhile grinding away for all it was worth.

There are many species of cicadæ in China, but this one (*Cryptotympana recta*, Walker) is perhaps the commonest, as it is also the largest, and is accountable for the greater part of the "scissors-grinding," but it commences its song later than several other species, not till about the middle of May. It is a fine insect, measuring nearly 5 inches over the fore-wings, the body black with a few markings of reddish yellow, chiefly on the under side. The wings are transparent, except the basal part, which is yellowish shading to deep brown or black next the body. During the day it sits close on the trunk or branch of a tree, at intervals making its shrilling noise, gently at first, but gradually getting louder till when one is close to the insect the sound is deafening; then gradually it decreases and stops with a jerk, after which performance it sometimes takes a short and swift but erratic flight to another tree.

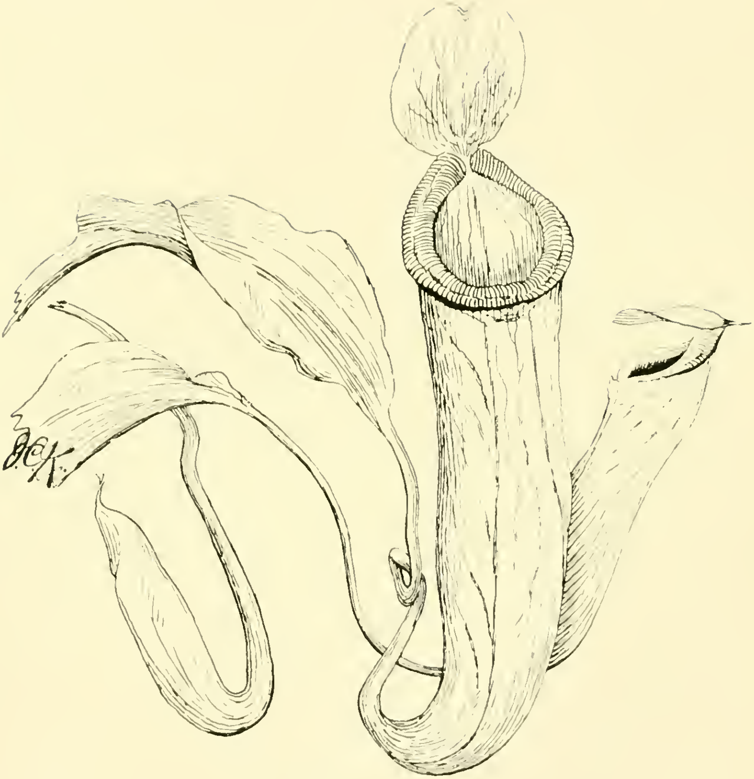
They are very spry and quick in taking flight, and to catch them with a net is very difficult, as they sit against a branch, but the Chinese capture them in large numbers by the aid of a long bamboo smeared at the end with bird-lime. They are transferred to a bamboo cage, and one often sees a cageful of cicadæ, all grinding away, carried through the streets of Hong-Kong, to be sold for hanging up in the house in a little cage, as the Chinese are fond of hearing them "sing." They call them Li-chee sim, *i.e.* Lichee insect, as they are most in evidence during the Lichee fruit season. Sometimes a child is given a cicada in a twist of paper, to act as a substitute for a rattle.

These insects are called "scissor-grinders" by the foreigners in China, a very apt name, as the sound they produce reminds one very much of the street knife-grinder at home.

2. A Chinese Pitcher-Plant.

One of those curious plants of the family Nepentheaceæ is found in many places in the south of China, and another closely allied plant, *Nepenthes phyllamphora*, is peculiar to S. China, one of its localities being an island close to Macao.

The former species, *N. distillatoria*, is found in wet, marshy ground, both at sea-level and some distance up the slopes of the hills, frequenting much the same localities as the sundews. The chief feature of the plant is the "pitcher" formed at the end of the leaf; these vessels are



NEPENTHES DISTILLATORIA.

usually half-full of water, and sometimes almost choked with drowned insects, but, unlike the sundews, this *Nepenthes* is not insectivorous, the creatures merely falling in whilst sucking up the moisture. It does not affect the shade, but may be found under a blazing sun in exposed situations. The general colour of the leaves and stem is a light green, the stem reddish in places. The pitchers are light green, reddish towards the aperture, and veined with darker red. The lids are reddish, also veined with darker colour. The incipient vessels are wholly green. The flowers, which open in July and August, are arranged on a spike about 8 inches in length, but are insignificant in size and colour. The plant grows about a foot in height, but bends over and extends laterally. Though sometimes close together, the plants do not form a regular bed. The leaves branch immediately from the central stem. The length of the pitchers varies from about 4 to 6 inches, the diameter at the widest part from ¾ to 1¼ inch. They vary somewhat in shape, but those figured are typical.

The Mourne Mountains and their Beetle Fauna.

By John W. Ellis, M.B., F.E.S., *Liverpool Nat. Field Club.*

The picturesque group of the Mourne Mountains, that rear their granite peaks between Carlingford Lough and Dundrum Bay on the north-east coast of Ireland, affords such an excellent hunting-ground for the field naturalist—whether botanist or entomologist—that no apology should be necessary for introducing to the notice of the readers of the *F. N. Q.* a district that has not been explored by the lover of nature to anything like the extent that it deserves; and this is the more to be wondered at when one considers its easy accessibility, from Belfast on the north, or from Dublin or Greenore on the south, and the excellent accommodation —both hotels and private apartments—provided at the principal centres—Newcastle, Warrenpoint, and Rostrevor.

Of these, Newcastle is, perhaps, the most convenient, lying as it does immediately at the foot of Slieve Donard, the highest of the peaks; and with roads radiating in several directions that all lead into charming scenery for those who are not able to devote their energies to rough scrambling up the heathery slopes of the hills, or to tramping by the, in places, boggy margins of the various rivers that occupy the intervening valleys; with the near proximity of three extensive demesnes open to the public on certain days of the week; and with a splendid bay with a beach of hard sand for sea-bathing; all these ought to tempt more seekers after fresh air and healthy exercise to Newcastle than the golf links that at present form the attraction to the majority of its visitors.

Slieve Donard is, of course, the point to which the attention of the field naturalist will be early attracted, and its ascent is not a matter of any difficulty to one who does not require a beaten path among its rock-strewn heathery slopes. Perhaps the easiest ascent is that through the Donard Lodge demesne, a delightful natural park that half-encircles the little town of Newcastle, watered by the sparkling Glen river that, rising in the boggy hollow between Slieve Donard and Slieve Commedagh, pours itself over nearly a mile of cascades and water-slides through a picturesque woodland of pines and other forest trees—a veritable paradise for the field naturalist, the artist, or the photographer. The demesne is open freely to the public on four days in the week, and the route followed should be along the banks of the Glen river until the boundary wall of the estate is reached, when we can strike across the open moorland, along a tributary stream, and make our way up the steep side of Thomas Mountain, from the summit of which a mile of fairly rough walking will bring us to the cairn on Slieve Donard (2796 feet). Long before this, we shall, of course, have had many a look backward over the ever-widening and glorious prospect that lies to the north; and the summit reached we shall, if the day be fine, be charmed with the great expanse of country visible, from the Cave Hill, near Belfast, on the north, to the Hill of Howth, near Dublin, on the south, while the intervening country in the latter direction is occupied with a picturesque group of peaks, central and most conspicuous among which is the castellated head of Slieve Bingian with its mountain tarn shimmering on its northern flank. The descent may be made directly to the south-east, to the river that flows between Millstone Mountain and the Chimney Rock, or we may follow a trench that has been cut from the cairn down the west side of Slieve Donard to the shapely mass of Slieve Commedagh, and follow the ridge of this mountain to Shan Slieve, and by an easy descent regain the point whence we started, having encircled the great *cwm* and the Eagle rocks that are so conspicuous a feature in the view of the mountain from Newcastle itself.

The whole Mourne Mountain district is particularly rich in subalpine plants and insects, and among the former may be mentioned: *Saxifraga stellaris*, *Saussurea alpina*, *Juniperus nana*, *Vaccinium vitis-idæa*, *Empetrum nigrum*, *Salix herbacea*, and, among the ferns and fern-allies, *Allosurus crispus*, *Cystopteris fragilis*, *Hymenophyllum unilaterale*, *Lycopodium alpinum*, etc.; while in the mountain tarns grow *Isoetes lacustris* and *Lobelia Dortmanna*.[1]

Among the more interesting insects that have been recorded from Slieve Donard and its neighbouring heights are the beetles *Otiorrhynchus maurus* and *Leistus montanus*; and it was with great pleasure that we were able, in a recent visit, to add both these species to our collecting bottle—or rather, to introduce such welcome finds to special tubes for more careful preservation.

From our observations of the locality and experience of the collecting of subalpine Coleoptera on the mountains of Wales, we would suggest as the most likely spots for the beetle collector on Slieve Donard—(*a*) the southern slope, towards the Chimney Rock, strewn with smallish stones; and (*b*) the descent to the *col* and the ascent to Slieve Commedagh, where the slopes are more grassy, and insects more easily found under loose stones than on the more thickly heather- and bilberry-clothed northern and eastern slopes. It was interesting to meet with quite a large proportion of red-legged *Nebria Gyllenhali*; in all other localities where we have met with this insect, *with the exception of Snowdon*, the black-legged form has been invariable. Search was made for species of *Elmis* that inhabit the running streams, adherent to submerged stones, but without success.

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[1] See Stewart and Præger, "Report on the Botany of the Mourne Mountains," *Proc. R. I. Acad.*, 3rd ser., vol. ii. 1892.

Slieve Donard is one of the very few localities in the British Islands for that handsome ground-beetle *Carabus clathratus*, whose violet-black body, over an inch in length, with rows of bright coppery impressions on the wing-covers, must make it a conspicuous object on its native hill-sides. The search for this insect formed the *raison d'être* of our visit to the Mourne Mountains last Easter, but it did not put in an appearance. The weather, as will be remembered, was exceptionally cold for so late an Easter, and it was quite evident that many species of beetles had not yet emerged from the snug retreats beneath great stones and among the roots of heather where they had passed the winter; while many of those that were found were quite torpid.

So little has been written about the insect fauna of this district that a list of the various species of Coleoptera met with in our four days' collecting may be of service to some of our fellow field naturalists:—

Carabus granulatus	Dundrum.
Notiophilus aquaticus	Slieve Donard.
,, *biguttatus* . . .	Common.
Leistus montanus	Slieve Donard.
Nebria brevicollis	Common.
,, *Gyllenhali*	Slieve Donard, abundant.
Clivina fossor	Dundrum.
Broscus cephalotes	Newcastle Shore, under refuse, common.
Badister bipustulatus	Dundrum.
Bradycellus cognatus	Slieve Donard.
Harpalus ruficornis	Common.
,, *proteus*	Common.
,, *latus*	Slieve Donard, common.
Pterostichus madidus	Common.
,, *vitreus*	Slieve Donard.
,, *strenuus*	Slieve Donard.
,, *vulgaris*	Common.
,, *striola*	Dundrum.
Amara trivialis	Common.
Calathus melanocephalus var. *nubigena*	Slieve Donard, common.
Anchomenus albipes	Dundrum.
,, *parumpunctatus* . .	Common.
Bembidium littorale	Common.

Trechus obtusus	Slieve Donard.
Myrmedonia canaliculata	Common in ants' nests.
Tachyporus solutus	Locality not noted.
Quedius molochinus	Slieve Donard.
„ *tristis*	Common.
Ocypus cupreus	Dundrum.
Philonthus politus	Common.
„ *varius*	Common.
„ *marginatus*	Slieve Donard.
Xantholinus linearis	Common.
Othius fulvipennis	Slieve Donard.
Lathrobium fulvipenne	Common.
Olophrum piceum	Slieve Donard.
Silpha atrata var. *subrotundata*	Common.
Choleva augustata	Slieve Donard.
Byrrhus fasciatus	Slieve Donard, common.
Cryptohypnus riparius	Slieve Donard, common.
Agriotes obscurus	Common.
„ *lineatus*	Several.
Helops striatus	Under fir-bark, Donard Lodge demesne, abundant.
Otiorrhynchus sulcatus	Slieve Donard.
„ *maurus*	Slieve Donard.
Cneorhinus geminatus	Sandhills, Newcastle.

Flowers and Inflorescences.

By E. M. Wood, *Liverpool Naturalists' Field Club.*

ALTHOUGH we may say that summer and flowers are synonymous, there is hardly a time in our country in the whole cycle of the year that some flowers are not in existence. Even in the cold grip of winter's frost, some hardy flowers, such as the groundsel or the daisy, brave the cold and struggle to show a cheery face in adverse times. But summer brings the flowers in their welcome thousands, in such satisfying numbers, colouring and perfuming the countryside, that indeed the valleys may laugh and sing as in the time of plenteous harvest. It is the effort of nature to produce seed, or the equivalent of seed, and the organs by which this is accomplished in phanerogams or flowering plants, are contained in the part of the plant commonly called the flower, which exhibits an immense variety of shapes, sizes, and colours, as well as great differences in the numbers and positions of its special parts. A complete flower is composed of four distinct whorls or series of organs, each having its own particular part to play in the life of the plant. These organs are the result of a special development from foliage leaves, although some of them bear but little resemblance to ordinary green leaves. Now and again we see what we are pleased to call "sports"—flowers bearing green leaves in the place of the usual sepals or petals, showing thereby a tendency to return to the original leaf-form.

The four series of organs of which the complete flower consists are:—the calyx or protective whorl, composed of usually green sepals; the corolla or attractive whorl, composed of usually coloured petals; the stamens, consisting of usually filaments and anthers; and the pistil, consisting of usually ovary, style, and stigma. These two last are called the essential or reproductive whorls. We use the word "usually" purposely, because there are infinite variations from the typical forms and combinations. The calyx encloses the rest of the flower, when in bud protecting the reproductive organs from injury. The petals are the attractive parts of the flower, being coloured and often beautifully marked, spotted, streaked, or sweetly scented; or in many cases have all these qualities combined, to attract flying insects, which are useful in carrying pollen from flower to flower. The stamens are the male part of the flower, producing in the anthers the pollen grains; the pistils being of the opposite sex, the receptive portion of the reproductive whorls, bearing ovules, which after fertilisation, become, under favourable conditions, the seeds of the plant.

There are, however, flowers which discard certain of these whorls, especially the petals or attractive whorl. The calyx is seldom dispensed with. There are fixed reasons why these certain parts are not produced. One reason is that the flower may be provided with a calyx of coloured sepals, which serves a double purpose; or the flowers may not require the services of insect visitants, relying on the winds of heaven, as the agents by which their pollen may be distributed; or, again, the flower may be (but this is rarely the case) self-pollinising.

Although a flower must possess the four sets of organs already enumerated, to be a "complete" flower, it is only necessary for it to possess the essential or reproductive organs, namely, stamens and pistils, to be a "perfect" flower; therefore a complete flower is a perfect flower, but it does not follow that a perfect flower is a complete flower. For instance, a buttercup is a complete perfect flower, and a marsh marigold is an incomplete perfect flower. The flower of the ash (*Fraxinus excelsior*) is a perfect incomplete flower, but the flowers of the willow are incomplete and imperfect, because each individual flower consists solely of stamens in one case, and a single pistil in the other. Then, again, there are flowers which have their calyces and corollas composed of separate sepals and separate petals; whilst there are others where the sepals are joined together by their edges and comprise a tube-like organ, and are termed "gamosepalous." The petals are likewise joined together in the same fashion, and are termed "gamopetalous." But it does not follow that a flower having a gamosepalous calyx has a gamopetalous corolla. For instance, the calyx of campion is tubular and the sepals joined together, excepting at the free end, where it is broken up into short points or teeth, whilst the petals are separate one from another.

One more form of the flower is the perianth, commonly seen in the petaloid monocotyledons, where the floral envelope is formed of sepals and petals, so resembling each other that nothing but a close examination can determine the position of the respective whorls; both protecting and both attracting. Look, for instance, at the white Mary-lily, which is so graceful a plant in sheltered gardens in summer-time, there are six broad white divisions of the perianth all precisely alike in shape and colour; or the lily-of-the-valley with its rounded bells, the wild hyacinth or the iris, or dozens of others which are found to have the same peculiarity.

Some polypetalous flowers are almost geometrically developed, all the parts being alike in shape, such as those of the wild rose or the buttercup; on the other hand, some are developed irregularly, some of the petals distinctly and invariably unlike the others. We have the pansy and the sweet-pea and many of their near relations, with what are called zygomorphic flowers. Among the gamopetalous flowers this irregularity of development is marked in the natural order Labiatæ, of which the white dead-nettle may be quoted as an example, with its graceful overarching hooded upper lip and the protruded flattened lower lip. Also the very nearly allied order Scrophulariaceæ, many of the corollas, such as the snapdragon, have the most irregular forms. Among the perianths, the flowers of the Orchis order are strangely irregular, having a " floral doorstep " quite different from the other divisions of the flower usually patterned with streaks and dots of a darker colour than the rest of the perianth.

That nature makes the most economical use of existing materials is shown by the way in which some parts of the flowers are modified into useful appliances.

Many flowers secrete nectar or honey, which is the wage they offer to the labourers in the flower fields—the bees and other insects, which perform the necessary task of conveying pollen from one flower to another.

Sometimes the honey is simply held in the hollow of a tiny depression at the base of the petals or corolla, while at others a longer or shorter tube or spur is produced for its reception. Such nectaries may be found in the Tropæolum, where the calyx is spurred; in the columbine, the monkshood, and the valerian, where the petals and corolla are spurred; in the larkspur both the calyx and petals; or in the violet or pansy one of the petals and two of the stamens are similarly developed. In the Orchidaceæ the majority of the perianths, in our indigenous species, are likewise spurred, and contain rich stores of nectar.

We must not forget, in enumerating the numberless forms of flowers, the fact of " single " and " double " flowers, those which possess only a normal number of parts, and those which contain these parts multiplied again and again. What is the reason of this prolification? The majority of wild flowers are single, so that we may take it that cultivation is responsible for the change in the flowers, and that some organ must be done away with to find room for the new departure. It is usually the petals of a flower which are multiplied, and the stamens pressed into service to form those petals. You may see the gradual change taking place in flowers such as the tulip, where one-half of a stamen is petaloid, and the other half is rolled up still as one lobe of an anther,—the filament of the stamen is really being flattened out and enlarged to form a petal. Where plants are much cultivated and taken care of for the sake of their flowers alone, where the propagation of the species is carried on by means of slips or cuttings, the reproductive organs become unnecessary to the plant, and are therefore dispensed with altogether in course of time, and the purely ornamental portion of the flower takes henceforth the most prominent place. Flowers which have typically numerous stamens, such as roses or poppies, are most inclined to become double. It is a retrograde condition, a slipping back to the foliar origin of the floral organs.

The inflorescence of a plant is a special branch upon which flowers are produced. There are many varieties depending upon the style of branching and the relative position of the flowers.

Inflorescences have been divided into three classes—the indefinite or racemose, the definite or cymose, and the mixed inflorescences.

In the first we have a branch of flowers, sessile or stalked, borne on an elongated axis or stem, the lowest flowers opening first, the youngest being towards the apex. Sometimes the flowers, instead of being placed one above another, are arranged side by side, and in such cases the youngest flowers are in the centre.

The two principal forms of indefinite inflorescence are the spike, as that of the wayside plantain or the wheat, and the raceme, as of the foxglove or snapdragon. These are again divided into the varieties of the spike as follows:—the catkin of the hazel, the strobile of the hop, the spadix of the arum, and the cone of the Scotch fir; whilst the varieties of the raceme are the corymb of the hawthorn, the panicle of the oat, the thyrsus of the lilac, the hypanthodium of the fig, the capitulum of the daisy, the simple umbel of the cowslip, and the compound umbel of the chervil.

The definite inflorescence is one where the growth of the axis is stopped by the production of a flower, and all subsequent flowers are produced in the axil of the primary stem and lateral branches.

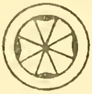
Such an inflorescence is termed a cyme, and has again many varieties. Examples are seen in the single flowered inflorescence of the wood anemone, or the many flowered cymes of the buttercup, the bramble, stitchwort, the henbane, the rock rose, and in the verticillasters of the dead-nettle and box.

A mixed inflorescence is a term applied to collections of flowers which exhibit both of the foregoing types. For instance, the inflorescence of the dead-nettle is indefinite, taking the whorls of flowers as a whole, the lowest whorl of flowers opening first; whilst each individual group of flowers is a verticillaster, the innermost flowers opening first. The same thing occurs in most of the Compositæ, each capitulum is indefinite; but the arrangement of the whole system of inflorescences is definite, the terminal capitulum is first to open. It must be remembered that in speaking of double flowers we are apt to apply the term to the flower-heads of daisies and dahlias, etc., whereas they are in reality groups of single corollas, whole inflorescences with rayed corollas which are often taken for petals.

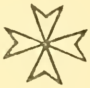
Archæology.

S. MICHAEL'S CHURCH, GARWAY, HEREFORDSHIRE.—III.

By Rev. P. J. Oliver Minos, Ph.D., M.R.A.S. (Lond.).



Templars' Cross.



Hospitallers' Cross.

"Silas Taylor, who wrote his Collections for a history of Herefordshire (MS. Harl. 6726, f. 53) during the Protectorate, and seems to have visited the whole county with the eye of an antiquary, tells us, that in his time 'there were stately ruins of a religious house.'"—*Archæologia*, vol. xxxi.

Nothing, except the chapel or temple of the Templars, remains now above ground.[1] This chapel adjoins the parish church of Garway, and it shall be the chief subject of my concluding article on Garway.

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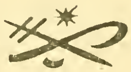
[1] The site on which the preceptory stood is still known as "Clas" (or Clos) B, a cloister. It is included in the Church (or Home) Farm of the Templars,

On the south of the chancel of S. Michael's Church stands the Templars' chapel (28 feet long by 13 feet 9 inches). It has no dedication; but yet it bears evidence of consecration, viz. on a special stone, 17 inches by 18 inches, near the jamb of the west entrance of the chapel, is to be seen an incised cross potent.[1] Still standing outside and looking up at the west gable, one sees a "lamb passant," carrying a banner charged with a cross. This is the well-known symbol of "The Lamb of God." (On a seal of the Templars attached to a charter of A.D. 1304, now in the British Museum, "The Lamb of God" appears with the motto, *Testis sum Agni.*) Lower down is a square-headed window; and still lower down is the west entrance with slightly pointed head. Notice the right and left corners of this head: they are formed of different shaped stones. The left corner-stone has a curious design incised on it: cross patriarchal and pastoral staff crossing (diagonal dexter and sinister) each other at the middle, with an eight-pointed star above and a crescent below. This design represents briefly the early history of the Order: the cross patriarchal refers to the period when the Templars acknowledged the jurisdiction of the Patriarch of Jerusalem; the pastoral staff refers to the office of the Grand Master, who was a bishop[2] to the Templars; the eight-pointed star represents the baptized and confirmed Christians; the crescent,[3] the Saracens.



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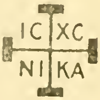
alienated from the Church since the suppression of the Hospitallers by the Act of the 32 Henry VIII. cap. 24 (1540).

[1] This cross potent consists of four tau (T) crosses; it is a cross generally worn by Eastern Christian children as a *charm*. On the bronze gates of the ancient cathedral of Constantinople (now a Moslem mosque), this cross still appears after centuries of desecration.



[2] On the corbels terminating the outer dripstone of the east window of the chapel are to be seen, on the left a head wearing a mitre, on the right a mask or dead man's head. This, no doubt, was to remind the Templars of the Grand Master in life and in death.

[3] The crescent was the old symbol of Constantinople; the Turks assumed it on the capture of Constantinople. It is not a Moslem emblem, but the emblem

Let us now enter the chapel. This chapel was referred to in the tragic drama of the unjust dissolution of the Order in 1312. The initiation into the Order was strictly secret, insomuch that the south wall of the chapel had no windows—the present two south windows (debased perpendicular) are doubtless *insertions*, as a Templar's tomb-slab with a cross flory forms the flat head of one of them; the east and the west walls had windows very high up; also that the west door had a bar right across from the inside. Still at this distant date, the stones are eloquent, and do reveal something about the initiation; on entering the chapel and closing the west door, one would notice on the left a large stone with a deep hole (the right one is filled up) for the bolt across. On this stone, a roughly incised bent or halting leg with pointed shoe (no spur) appears; and on the right wall (where the stoup ought to be), two fishes bound together by their tails appear.[1] Still facing the west door, and on looking up one sees a cracked tympanum with incised spear, ladder, three nails, tau cross with crown above, sword, sponge on a reed, and cup with cover. To interpret the above, I would venture the following:—The candidate for initiation into the Order is led blindfolded to the chapel; therefore, he enters cautiously with bent or halting steps. After taking the vows of poverty, chastity, and obedience, he is invested with a white mantle,[2] decorated with the instruments of the passion of our Lord as represented on the tympanum. Lastly, he is taken by the hand and welcomed as a brother, symbolised by the tied fishes.[3]

Near by the west door, a "dug-out" would be noticed. It is made of a good, sound butt of oak, measuring about 8 feet 6 inches in length, 1 foot 4 inches in depth, and 1 foot

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of the metropolis of the Greek Empire. The Eastern Empire is the moon; the Western Empire the sun. The horse-shoe is the true emblem for Moslems.

[1] "Curious mystical figures are always seen upon the Templars' monuments: in the fishes bound together by the tails, on the tombs in Italy, and appearing on the vaulting of the Temple Church, London."—Hargrave Jennings.

[2] Pope Honorius, at the request of Stephen, Patriarch of Jerusalem, prescribed an Order of life, whereby they were to wear a white garment; and Pope Eugenius added thereto a red cross.

[3] The fish in ecclesiastical archæology has a double meaning: (1) Christian people, and (2) sacred acrostic.

9 inches in width. This coffer is very primitive in its structure; the lock is only a horse-shoe widened out at the ends; the iron bands overlap their ends and are fastened down by a piece of wood and nails. Besides this coffer there is a second coffer, 4 feet 2 inches long. It is divided into two 26-inch divisions, and each division having three separate locks. Canon 70 of the canons of A.D. 1603 ordered that the coffer in which the registers and the church plates were kept should have three locks and keys for the priest and two churchwardens.

Advancing to the east end, one would notice on the right a piscina with a stone credence in perfect condition. On the piscina a curious device is seen: a cup or chalice with the consecrated wafer standing half-way above the rim of the cup, and the cup itself has a triangle incised on its surface. This cup has a pair of curved wings; and under the wings are a fish [1] on the right, a horned adder on the left. Evidently the device speaks in stone language of the exaltation of the consecrated bread and wine; the Christian looks up in faith and love how he may serve and worship God, but the evil person looks up and deviseth evil things out of his evil heart how he may vex God. There is also an aumbry close by.

On the north side of the chapel a beautiful Early English arcade of two arches open into the chancel of the parish church. These arches are very Early English, as the angles at the heads are not acute, and the pillars are short and thick, *i.e.* Norman-like. These pillars have each four smaller (much) pillars, banded together 6 feet high from the base. Here let me point out that the Early English tool-marks may be seen and studied with advantage. I will quote Professor T. Hayter Lewis, who writes: "At quite the latter end of the twelfth century there appeared in England that beautiful style—the Early English—bearing the general outlines of the Norman forms, but clearly marked out from the Norman by its exquisitely beautiful details, which distinguish it, also, clearly, from French work of the same period; and with the altered style came altered tools and altered modes of working them. The neat diagonal dressing was abandoned, and, in place of it, there was used the claw tool, the strokes being usually upright where the surfaces are flat, but following the lines of curves and mouldings as in Norman work.

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[1] The Greek word ΙΧΘΥΣ (fish) is made up of the initial letters of the words ΙΗΣΟΥΣ ΧΡΙΣΤΟΣ, ΘΕΟΥ ΥΙΟΣ, ΣΩΤΗΡ. Tertullian (about A.D. 196) says: "We poor fishes, following after our ΙΧΘΥΣ Jesus Christ, are born in water."

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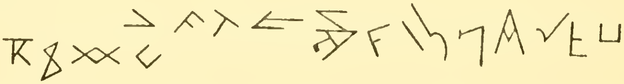
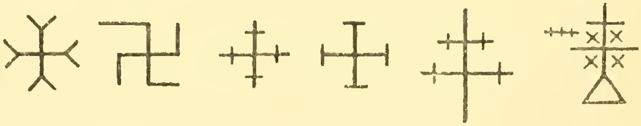
These changes had, no doubt, been shadowed forth in the later period of the Norman style, but, nevertheless, the contrast between characteristic specimens of the two styles is so clear and sharp as to be altogether unmistakable; and although you will find instances of the claw tool being used during the Transition period, I can call to mind scarcely one instance in which the diagonal dressing was used after the advent of the pure Early English style. Now whence did this claw tooling come? It was not an invention of the thirteenth century. You may trace it back ages before it was known in England, through Italy and Greece to Palestine. I can trace it no farther eastward."

Writing of tool-marks, reminds me of masons' marks on the exterior of the chapel. The following are some of them:—



There are also the following forms of the cross incised on the exterior walls:—



In conclusion, let me briefly dwell on the dissolution of the Order: it is an interesting fact that both the preceptor of Garway, and one who was some time a chaplain, are personages who figured at the time of the inquisition. Philip de Mewes was the last preceptor of the Templars at Garway. He was seized and imprisoned in the Tower.

His signature follows immediately that of Thomas de la More, Master of the Temple, London. John de Stoke, chaplain of the Order and treasurer of the Temple, begun his career at Garway. Besides these, James de Molay, Grand Master of the English Templars, seems to have visited Garway. He was afterwards the Grand Master of all Templars. Jacques de Molay was, on the 19th of March 1314, burnt upon a pile erected upon that point of the islet of the river Seine, at Paris, where afterwards was erected the statue of Henry IV. of France. This Molay, ere he expired, summoned Pope Clement, who had issued the bull of abolition against the Order and had condemned him (the said Molay) to the flames, to appear, within forty days, before the Eternal Judge; also, he summoned King Philip to the same tribunal within one year. Both predictions were fulfilled. Pope Clement did actually die of a colic on the 19th of the following month. More dreadful still, the church in which his body was placed in state, took fire, and the corpse was half-consumed. The King, before the year had elapsed, by an accidental fall from his horse, also died.

British Field Zoology.

By various Writers.

CHAPTER III.—THE PROTOZOA (*continued*).

By H. E. Forrest.

A very common animal in our ponds is *Arcella*, a close relation of *Amœba*. It is, in fact, identical, except that it secretes a horny shell shaped just like a hat (Fig. 7). The shell is of a clear brown colour, and is found attached to the water-weeds, but the protoplasm is not granular, as in *Amœba*, and is so transparent that it is generally invisible.

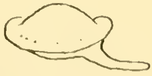


Fig. 7.—*Arcella.*

Another less common pond-dweller is the Sun-Animalcule (*Actinophrys*, Fig. 8). In this the protoplasm is blown out into a frothy globe, from the surface of which radiate long needle-like pseudopodia. When undisturbed these extend more than the diameter of the body and look like spines. They are quite soft, however, and can be entirely withdrawn into the body. If a passing animal touches the pseudopodia it adheres and is drawn slowly with them into the body. We may incidentally mention that the animals which build the beautiful little marine shells familiar to microscopists as Foraminifera and Polycystina (Radiolaria) are identical in structure with *Actinophrys.* So far all the forms described belong to the Rhizopoda and have no definite cell-wall.

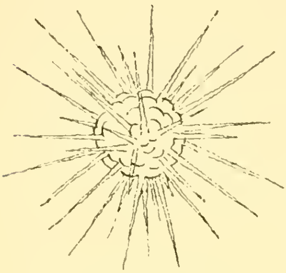


Fig. 8.—*Actinophrys.*

The forms comprised in the other large division of Protozoa—the Infusoria proper—all have a definite cell-wall. Amongst the many hundreds of species it is very difficult to select types for description, but I will take first one of the most beautiful and abundant, namely, *Vorticella*, which may be found in myriads attached to the weeds in ponds and canals. In autumn when the weeds have ceased to grow I have often seen them so coated with *Vorticellæ* that there was a greyish film over the plants distinctly visible to the naked eye.

If a piece of this weed be placed under the microscope (using a compressorium and black background illumination), a scene of wondrous beauty and animation is presented to view. Attached to the weed are hundreds of living crystal vases, their edges fringed with circles of whirling hairs which flash in the brilliant light as they lash the water into circling eddies. Suddenly the edge of a vase caves in and the creature is withdrawn as if by magic, its stem thrown into a close spiral coil, which shortens it to a fraction of its full length. The next moment the stem slowly and gracefully uncoils, the edges of the vase unfold, and the cilia again resume their mad course.

Not to dwell longer on the charming grace of this spectacle, we will proceed to examine an individual *Vorticella*, and notice first the points in which it resembles *Amœba.* The interior of the body is filled with a granular protoplasm, in which we notice food vacuoles, a contractile vesicle, and a nucleus. This last in *Vorticella* is a long sinuous band (Fig. 9). On further examination we shall find many points in which *Vorticella* is more highly specialised than *Amœba.* It has a distinct cell-wall, which is cup-shaped, and this cell-wall has appendages. The most important is the stem which unites the animal to the weed, and which contains a muscle that by its contraction throws the stem into spiral folds. *Vorticella* cannot take food in anywhere, like *Amœba*, but has a distinct mouth just within the rim of the cup: a short tube or œsophagus leads directly into the interior protoplasm. Lastly, *Vorticella* is provided round the edge of the cup (which is thickened like a pneumatic tyre) with a quantity of fine lashes called cilia (=eyelashes), which, by their motion, create currents in the water. The name Vorticella means a little whirlpool. Particles of food brought by the current are selected by the animal and taken into the mouth, where they are held till they accumulate into a tiny pill; then they are swallowed. The animal certainly exhibits sensibility in differentiating between various floating particles; but its instincts are sometimes at fault. I have amused myself often by putting small quantities of carmine or Prussian blue into the water. The *Vorticella* swallows the particles, so that its interior shortly presents brilliant bits of colour in neatly rounded pellets! This experiment demonstrates the existence of a short œsophagus, visible during the act of swallowing.

Cilia—the lashing hairs just described—play an important part in the animal world. Not only do they serve to create currents in the water, as in the case of a fixed Infusorian like *Vorticella*, but in the free Infusoria they propel the whole organism through the water. Again, in a very large number of the higher animals the young or larvæ are ciliated, and propel themselves through the water in this manner. The gills of molluscs and tadpoles are covered with cilia, and so are many of the internal surfaces (epithelium) of our own bodies. The cause of the motion in cilia is mysterious. Unlike muscular movements, it is certainly not nervous, since it is seen in animals with no nervous system, whilst in higher forms it goes on for hours after a piece of the ciliated surface has been severed, or even after the death of the body. We can only surmise that it is in some way connected with that diffused sensibility which we attributed to the living protoplasm of *Amœba* and other Protozoa.

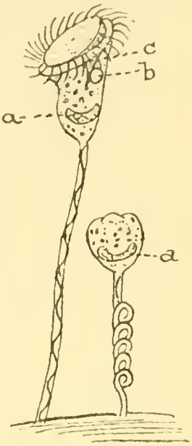


Fig. 9.
a, Nucleus.
b, *c*, Mouth.

One of the most striking characteristics of cilia is the ease with which they can be formed or obliterated. They are indeed merely prolongations of the cell-wall and the internal protoplasm. This is well shown during the process of self-division in *Vorticella*. I have watched this in the microscope many a time, yet the sight never fails to rouse feelings of wonder at the celerity with which the whole series of changes is accomplished. Under favourable conditions twenty to thirty minutes suffices.

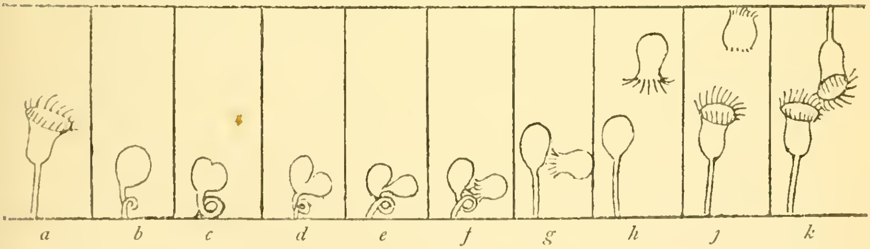


Fig. 10.

a, A single *Vorticella*. *b*, Withdraws and obliterates wreath of cilia.
c, *d*, *e*, Divides into two halves.
f, Cilia appear on one half, at first short and only waving slowly.
g, The cilia increase in length and rapidity of movement and cause the bell to begin to rotate till (*h*) it breaks away.
j, *k*, The half that remains attached to the old stem re-forms a ciliary wreath at its free end, whilst the free-swimming bell attaches itself by its ciliated end, obliterates the cilia, grows a stem, and forms another ciliary wreath at the opposite end.

Exactly the same processes, *minus* the self-division, are gone through, when for any reason a *Vorticella* wishes to shift its quarters. In such a case it withdraws the ciliary wreath, forms another at its attached end, breaks away from its stem, attaches itself anew by its ciliated end, withdraws those cilia, grows a stem, and opens another ciliary wreath at the opposite end.

Like *Amœba*, *Vorticella* encloses itself in a cyst to pass the period of rest between one season and another. It may become encysted either on its stem, or when detached.

It will be seen then that although *Vorticella* is more specialised than *Amœba*, since it has particular parts appropriated as organs of nutrition and locomotion, yet it is still a very simple unicellular organism, both the mouth and œsophagus, cilia and stem, being mere appendages and prolongations of the cell-wall and protoplasm.

The veteran microscopist, Ehrenberg, called these Infusoria "*Polygastrica*" (=many-stomached animals), under the impression that the food vacuoles in the body were a series of stomachs connected by an intestine. The fact that *Vorticella* has a mouth and gullet leant colour to this belief, but its fallacy is evident from the fact that the entire contents of the body are constantly, though very slowly, revolving within the cell-wall. This I discovered by keeping a single individual under examination, with a $\frac{1}{6}$-inch objective, for a considerable time, and noting the changes in position of the more solid particles in the protoplasm.

A boy who saw a giraffe for the first time remarked that it must be nice to have a long neck like that, because one could taste things for such a long time in swallowing! The giraffe amongst Infusorians is *Ophrydium* (Fig. 11), which is practically a *Vorticella* with a very small head but a very long neck and body. The length of its "swallow" becomes very apparent if it be fed with carmine or Prussian blue. The commonest species of *Ophrydium* (*O. versatile*) is of a bright green colour. It occurs in pools and canals in the form of pale green gelatinous balls about the size of a walnut, or larger. The species is interesting as being an example of the most primitive form of colony. The gelatinous matter is the joint product of all the individuals, and unites them into one mass. Each is embedded in it except the head with its ciliary wreath, which, when fully expanded, projects beyond the periphery. Each can withdraw itself within the mass at will, or, if so disposed, can quit entirely, swim away, and settle down elsewhere, secrete a new gelatinous sheath, and by continuous division produce a new colony.

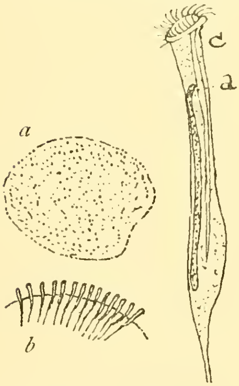


Fig. 11.—*Ophrydium*.
a, Colony.
b, Portion of same.
c, Individual.
d, Nucleus.

Certain members of the genus *Epistylis* (Fig. 12, distinguished from

Vorticella by not having a spiral muscle in the stem) attach themselves to the bodies of Water-Fleas, and thus, with no trouble or exertion to themselves, get carried far and wide. They are not parasites, since they draw no nourishment from the animal which bears them, though they probably pick up a good many "crumbs" from its meals.

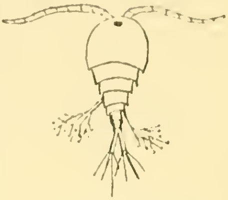


Fig. 12.—*Epistylis.* Two colonies attached to Cyclops.

In another genus, *Vaginicola* (Fig. 13), two individuals (each closely resembling an *Ophrydium*) dwell together at the bottom of a gracefully proportioned clear vase attached at its base to the water-weed. There seems a good understanding between the two little hermits, for they rarely both expand their ciliary wreath at the same time, and if they do, one pushes it out farther than the other, so as not to incommode its companion.

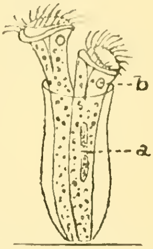


Fig. 13.—*Vaginicola.*

So far we have noticed cilia as the chief source of motion amongst the Infusoria. In many forms, however, instead of a number of short vibrating lashes, the animal is provided with a single very long whip-lash called a flagellum. (Some forms have two flagella.) These flagella work either by a rippling movement travelling rapidly along from base to tip, or a slow whip-like movement—the lash alternately bending and straightening. In the case of free organisms both these movements propel the animal forward, but I have seen certain species travelling along with the flagellum *in front*—a most mysterious proceeding. *Euglena viridis* (Fig. 14) is a familiar example of a flagellate Infusorian. It occurs in stagnant pools in farm-yards, and its countless millions colour the water a bright opaque green.

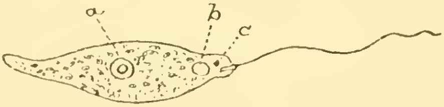


Fig. 14.—*Euglena viridis.*
a, Nucleus.
b, Contractile vesicle.
c, Eye-spot.

The Infusoria present such an endless variety of strange and beautiful forms that only a very few can be mentioned in a paper such as this, which aims rather at giving a general idea of structure and function than zoological characters. Anyone wishing to study the group further, or to identify genera or species, will refer to Mr. Saville Kent's *Manual of the Infusoria.*

We will conclude by taking two examples showing interesting modifications of structure—*Paramœcium* and *Stylonychia.*

Paramœcium (the Slipper-Animalcule, Fig. 15) is easily obtained in water in which hay or other vegetable matter has been steeped for a week or two. It is covered all over with powerful cilia, and is extremely active in its movements, darting hither and thither in the most erratic manner. Watching it under a 1-inch objective, the observer will notice that the animal has far better control of the cilia than the form we have hitherto studied, for it is able to *reverse* their motion and so propel itself in any direction at will. The mouth is in a funnel-shaped depression on one side of the body, and lines of long cilia converging to this point carry in food particles. The most interesting feature in *Paramœcium*, however, is the contractile vacuole, of which it has two, one at each end. It is a compound organ consisting of a central round vacuole, from which radiate several long narrow supplementary vacuoles. These last slowly fill up with clear fluid, and then apparently discharge their contents into the central vacuole, which in turn collapses in the way described before (*F. N. Q.*, vol. ii. p. 173).

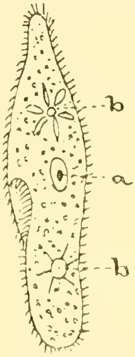


Fig. 15.—*Paramœcium.*

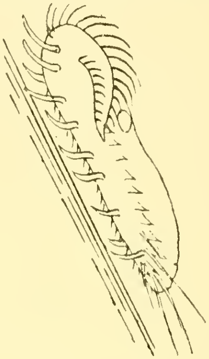


Fig. 16.—*Stylonychia.*

Stylonychia (the Mussel-Animalcule, Fig. 16) is remarkable for having, in addition to ordinary cilia, a number of long stiff bristles jointed at their junction with the under surface of the body. It can move these independently, and uses them as limbs to *walk* with. Although these are wonderfully like the limbs of Arthropods (Insects, Crustaceans, etc.), they are, in fact, only modified cilia, and we here see, perhaps, the highest pitch of specialisation to be met with amongst the Protozoa.

Record of Species Observed.

Species.	Common Name.	Locality.	Date.	Observer.
C. canorus	Very Interesting Note on the Habits of the Cuckoo	Chesterfield	June 20	*Field*— E. Cowley
P. leucorodia	Spoonbill	Great Yarmouth	May 30	A. Patterson
E. luscinia	Nightingale (nesting)	Devon	,,	W. Tegetineier
N. epops	Hoopoe	Rye	May 5	E. Whiteman
M. muscardinus	Dormouse	Middlesex	,, 10	D. and Viator
C. monedula	Jackdaw (domed nest of)	Saversnake Forest	April 1898	E. P. Adams
M. melanope	Grey Wagtail (breeding)	Berkshire	May 2, 1903	F. C. Selous

Species.	Common Name.	Locality.	Date.	Observer.
				Field (*contd.*)—
P. nigricollis	Black-Necked Grebe	Perthshire	April 19	M. Bedford
P. leucorrhoa	Fork-Tailed Petrel	Sweden	Dec. 1902	L.
F. nyroca	Ferruginous Duck	Builth	April 19, 1903	...
C. cineraceus	Montagu Harrier (breeding)	Sussex	1893	...
E. crepitans	Stone Curlew	Essex	April 24, 1903	R. C.
F. gyrfalco	Gyr Falcon	Lundy Island	Mar. 30, ,,	...
M. pugnax	Ruff	Hickling	April 29, ,,	M. C. H. Bird
F. nyroca	Ferruginous Duck	,,	,, ,,	,,
				Nature Notes—
T. casarca	Ruddy Sheldrake	Euston Park	Mar. 23, 1903	E. T. Daubeny
Clatonia perfoliata	Plant	Oxshott, Surrey	May 3, ,,	G. R. Ward
Myosurus min.	,,	,, ,,	,, ,,	,,
S. apiformis	Poplar Clearwing	Market Weston	June ,,	E. T. Daubeny.
				Nature Study—
Geocichla varia	White's Thrush	Brentwood	April	F. Gunnell-Woods
				Zoologist—
Otis tarda	Great Bustard	Thurles, Tipperary	Dec. 1902	Williams & Son
Q. scolopax	Stone Curlew	North Wales	Jan. 6, 1903	H. E. Forrest
C. corax	Raven (nesting)	Co. Antrim	Mar. 1903	W. C. Wright
S. curruca	Lesser Whitethroat	Cardiganshire	May 9, 1903	J. H. Salter
Dafila acuta	Pintail Duck	Near Knutsford	April 8, ,,	C. Oldham
E. morinellus	Dotterel	Near Chester	May 8, ,,	S. G. Cummings
C. livia	Rock Dove (nesting)	Cheddar Cliffs	...	Stanley Lewis
Sturnus vulgaris	Starling (brood hatched)	Shrewsbury	Jan. 6, 1903	H. E. Forrest
,, ,,	Starling (brood killed by frost)	,,	,, 8, ,,	,,
Bernicla brenta	Brent Goose	Cressage, Salop	Jan. 12, ,,	,,
Mergus albellus	Smew, Imm M.	Ensdon, Shrewsbury	Feb. 3, ,,	,,
Cannabina linaria	Mealy Redpoll	Ford, ,,	,, 9, ,,	,,
Œdicnemus scolopax[1]	Stone Curlew	Towyn, Merioneth	Jan. 6, ,,	,,
Zeugopterus punctatus[2]	Top-Knot	Aberffraw, Anglesey	May 2, ,,	,, ,,
Hydrochelidon nigra	Black Tern	Crosemere, Ellesmere	June 2, ,,	,,
Pernis apivorus	Honey Buzzard	Muchall, Wolverhampton	,, 23, ,,	,,
Falco vespertinus	Red-Footed Falcon	Cardiff	,, 7, ,,	T. W. Proger, reported to H. E. F.
Stilicus fragilis	Red-Necked Beetle	Gosfield, Essex	March 1903	Alfred Beaumont
Acidota crenata	Northern Brachelytron	Plymouth	April ,,	J. H. Keys
Sepsis punctum	Small Fly	Ryde, I.W.	May ,,	Claude Morley
Ichneumon nigritarius	Parasitic Fly	Bentley Woods, Suffolk	,, ,,	,,
Platypteryx lacertula	Hooktip Moth	,,	,, ,,	,,
Ichneumon consimilis	Wesmael's Parasite	Brighton	June 1902	Mr. Colthrup
Harpolus frölichii	Local Beetle	Foxhall, Suffolk	May 1903	Alfred Beaumont
Meteorus deceptor	Braconid Fly	South Essex	1902	Mr. Thurnall
Pimpla instigator	Parasitic Fly	Bury St. Edmund's	May 1903	W. H. Tuck
Pulex leporis	The Rabbit's Flea	Brandon, Suffolk	June ,,	Claude Morley
Pseudophlœus fallenii	Rare Heleropteron	Tuddenham, ,,	,, ,,	,,
Cryptus carnifex	Marsh Ichneumon	Brandon, ,,	,, ,,	,,
Borborus pedestris	Apterous Fly	,, ,,	,, ,,	,,
Thyamis dorsalis	Rare Beetle	,, ,,	,, ,,	,,
Dromius nigriventris	Small Ground Beetle	Felixstowe, ,,	,, ,,	,,
Therioplectes tropicus	Gad Fly	Raydon Wood, ,,	,, ,,	,,
Lopus gothicus	Uncommon Bug	Bentley Woods, ,,	,, ,,	,,
				Partly *Entomologist's Monthly Magazine*—
Agrotis ashworthii	Ashworth's Noctuid	Penmaenmawr	April 1903	G. T. Porritt
Notozus panzeri	Rare Ruby-Tail Fly	Lyndhurst	June 1902	Rev. F. D. Morice
Nematus pallidiventris	Saw Fly	St. Brelade's, Jersey	June 1903	,,
Menaccarus arenicola	Rare Hemipteron	St. Ouen's Bay, ,,	,,	Edward Saunders
Emblethis verbasci	,,	Don Bridge, ,,	,,	,,

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[1] New record for North Wales.

[2] This flat-fish is rarely taken on Welsh coast. Specimen is being placed in Bangor University Museum.

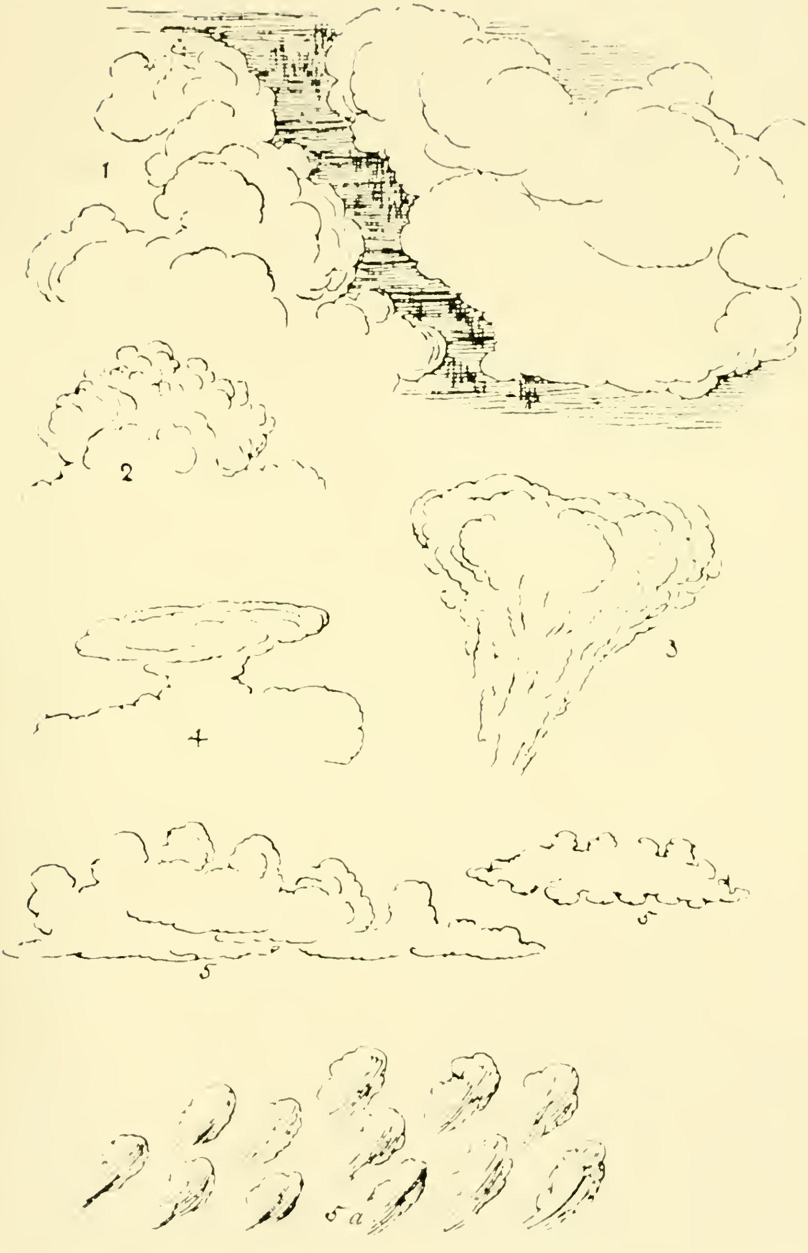
Species.	Common Name.	Locality.	Date.	Observer.
				Partly *E.M.M.*(*cont.*)—
Platypeza furcata	Uncommon Dipteron	Cambridge	,,	Francis Jenkinson
Agathomyia collini	,,	,,	Sept. 1902	,,
Oxylemus variolosus	Rare Beetle	Reading	April 1903	N. H. Joy
Cryptophagus validus	,,	,,	1902	,,
Blaps gages	Introduced Beetle	Bury St. Edmunds	April 1903	E. A. Butler
Pseudopsis sulcata	Tiny Brachelytron	Oxshott	...	Mr. West
Trechus rivularis	Rare Ground Beetle	Wicken Fen	Aug. 1900	A. J. Chitty
Onthophilus sulcatus	Rabbit Beetle	Brandon, Suffolk	June 1903	B. Tomlin
Harpalus picipennis	Coast Ground Beetle	,, ,,	,,	A. J. Chitty
Tychius tibialis	Rare Weevil	,, ,,	,,	Claude Morley
Apion sedi	,,	Tuddenham, ,,	July 1903	E. A. Elliott
Staphylinus fulvipes	Devil's Coachhorse	Bentley Woods, ,,	June ,,	,,
				Entomologist's Monthly Magazine—
Sapyga clavicornis	Rare Sand Wasp	Tarrington, Hereford	June 1902	Colonel Yerbury
Psen concolor	,,	,, ,,	,, ,,	,,
Odynerus lævipes	Uncommon Wasp	,, ,,	July ,,	,,
Panurgus calcaratus	Local Bee	,, ,,	Aug. ,,	,,
Ichneumon emancipatus	Parasitic Fly	Cusop, ,,	,, ,,	,,
Microdon mutabilis	Rare Fly	New Forest	1902	F. C. Adams
Hydroporus bilineatus	New Brit. Water Beetle	Deal	March 1891	A. J. Chitty
Chrysophanus dispar	Large Copper Butterfly	Yaxley, etc.	1820, etc.	C. W. Dale
Pachetra leucophæa	Local Noctuid Moth	Kent	May 1902	E. R. Bankes
Tinea linella	Rare Tiny Moth	Dillichip	June 1901	J. R. Malloch
Coccinella distincta	Ants' Ladybird	Woking	May 1902	G. C. Champion
Homalsta autumnalis	Brachelytron Beetle	,,	,,	,,
Parnus nitidus	Rare Water Beetle	Birkdale, Southport	July 1890	J. F. Dutton
Banchus moniliatus	Parasitic Ichneumon	Galashiels	July	J. C. Haggart
Exetastes illusor	,,	Retford	...	Rev. A. Thornley
Mesochorus mandibularis	,,	Methley, Leeds	Nov. 1899	J. Wigin
Acrobasis verrucella	New British Moth	Forest Hill, London	1858	R. M'Lachlan

The Field Naturalist's Library.

Reviews of Books, Periodicals, Etc.

The Cloud World. By Samuel Barber. London: Elliot Stock. Price 7s. 6d.

The object of this work is not utilitarian only, though the writer believes a good knowledge of the forms of cloud to be a greater acquisition than any mere acquaintance with instruments. He has always felt that accurate attention to particular forms of clouds must be the basis of all study of this subject, whatever direction the individual studies take in the end. It is certain that this accurate observation of detail is needful for accurate forecasting of the weather, an accomplishment which many profess to possess on very slight grounds. Hence we find in this book many forms of clouds delineated, and very instructive and interesting is the description. We are able, by kind permission of the publisher, to reproduce one of the page illustrations from the work, which shows how clearly the varying forms of cloud outlines are depicted, and how easily the student may learn them if he will only observe for himself. Many



1. Electrical masses, with wind. 2. Thunderstorm gathering.
3. Electrical, forming nimbus. 4. Anvil-cloud—wind.
5. Saw-cloud; and 5*a*. Electrical cirro-cumulus or "spatter" cloud.

other illustrations are from excellent cloud photographs, reproduced from the pages of that well-known journal *Knowledge*. The meteorologists in our field clubs should obtain this book.

THE ROSS BIRD-STALKER. By Charles Dixon. London: Ross Ltd. Price 6d.

This booklet, sent out by Messrs. Ross, is a report on the advantages, possibilities, and uses of the Ross Prism Binocular, as applied to field natural history. The writer, who is well known for his bird studies, has formed a very high opinion of these indispensable aids to accurate field observation, and we entirely agree with his remarks. The book contains some beautiful reproductions of photographs of birds and animals. Mr. Dixon concludes his report as follows:—"I bring this short report of an exhaustive test of the Prism Binocular to a conclusion by again confidently recommending the glass to all field naturalists who have not yet given it a trial. It has more than fulfilled all that I was led to expect from it. To me its many advantages and great superiority over every other field-glass which I have had occasion to use during a lifetime spent in natural history work, most of it in the open air, are abundantly obvious. Of course, the size of the glass is quite a matter of individual taste. My observations and tests were made with glasses of a magnification of eight, ten, and twelve diameters, but any of the three sizes will prove satisfactory. My own choice, however, leans to the most powerful instrument—No. 12, the difference in size and weight being but trifling and more than compensated for by the additional power. No. 8, however, is a very handy glass, especially for a lady's use, and is incomparably superior in every way to field-glasses several times its size and weight."

COUNTRY RAMBLES. By Percival Westell. London: H. J. Drane. Price 10s. 6d.

This new book from Mr. Westell's pen is practically his field naturalist diary for a year, and as such naturally contains much that is of interest to himself mainly. That is always the drawback to publishing a diary, it does not read as if written for the public eye, and much is recorded that appears somewhat insignificant when in print. But as a diary it is good and painstaking, and will provide field naturalists with a means of comparing their own district with that dealt with by Mr. Westell as regards the advent of flowers and birds. By far the best part of the book as a book is the illustrations, which are very numerous, of great variety of subjects,—some of which have apparently nothing to do with the text,—but all from good photographs. Some of these pictures are really excellent, and it is a pleasure to turn over the pages and look at them. Mr. Westell might have added a little more information about these illustrations for the benefit of those who would learn. Mr. F. G. Aflalo contributes an introduction to the book, in which he says: "It is above all the writer's enthusiasm that we may envy him, and that reflects itself in his pages to an extent that is contagious. With immense seriousness he records the daily life of a sparrow; the thrusting above the earth's surface of a blade of grass; the carolling of a lark in the heavens overhead,"—and this extract expresses exactly the spirit and character of the book.

SEA AND COAST FISHING. By F. G. Aflalo. London: Grant Richards. Price 6s.

This book comes at an opportune moment. Everyone is on the eve of going away for the summer holidays, and there is no question which crops up with greater frequency when the rival claims of seaside places are being discussed than that of "What is the fishing like there?" But it is one thing to know that there is good fishing at a place, it is quite another to know how to set about a successful enjoyment of it. Mr. Aflalo has given in this book exactly what the ordinary man who is fond of sea-fishing wants to know. It is a handbook of the latest practical methods of sea-fishing, and not merely the methods, but the best localities for each fish, or, at anyrate, those that attract the amateur. Mr. Aflalo begins at the beginning, taking for granted that folks want to know how to catch sea-fish with rod or line, but also taking for granted their absolute ignorance of the how, when, and where. Thus nothing is omitted, and the fish themselves, their habitats, the bait, and the tackle required, are all dealt with in turn. The illustrations are particularly good, and have been taken expressly for this work. The writer of this notice has had the good fortune to see Mr. Aflalo at work on the coast of Devonshire, and can assure his readers that what Mr. Aflalo does not know about the ins and outs of sea and coast fishing from Bournemouth to Mevagissey need not worry those for whom this book is intended. We only wish that the book had been in existence years ago, when we ourselves would have given a good deal more than the price of this work for a tithe of the useful practical information and instruction which it contains. There is not much doubt that every lover of sea-fishing will become the possessor of Mr. Aflalo's book, and will be very grateful to the author for having solved so many difficulties.

THE BOOK OF THE WILD GARDEN. By S. W. Fitzherbert. London: John Lane. Price 2s. 6d. net.

This delightful and eminently practical little volume forms vol. xiii. of the series of Handbooks of Practical Gardening published by Mr. Lane under the general editorship of Harry Roberts. We have not seen the other volumes, but if all are of the same standard of excellence and utility as this one by Mr. Fitzherbert, the series should be included in the gardening library of squire, parson, doctor, and resident of country villages where there is a chance of letting Nature have a little of her own way in one part at least of the estate, whether it be small or large. The information given is exactly what is wanted by those who are in the enviable position mentioned. The various chapters deal with Bulbs, Tall Plants, Dwarf Plants, Flowering Shrubs, Peat-Loving Shrubs, Climbers, Water-Plants, Plants for Moist and Boggy Ground, Wall-Plants, etc., directions for the selection of the most suitable species being given in each case. If these directions are carried out in the spirit here shown, many a neglected corner will become a thing of beauty. The book is illustrated by a series of excellent photographs by the author.

PHOTOGRAPHY FOR NATURALISTS. By Douglas English. London: Iliffe & Sons. Price 5s. net.

There are two methods of photographing wild animals. One is that made famous by the brothers Kearton, what is termed "Stalking Photography," or photography in which the camera is taken as closely to the animal as circumstances will permit, or else is fixed in some position in which the animal to be photographed is expected sooner or later to be, in which case the operator is dependent on his patience, power of observation, and the time at his disposal for his success. The second method is one which Mr. Douglas English has adopted with such success as to make his name a familiar one to all interested in the photography of animals, and is in some respects the opposite of the first method. It may be termed the photography of animals "by control." In other words, the animal is brought to the camera instead of the camera to the animal. It is the photography, not of wild life at home, but of wild life made to look at home, and, if possible, to feel at home. The results of this method as explained and illustrated in this volume prove that natural history studies are as good when done in this way as by the stalking method. Mr. English has taken considerable pains to give his sitters accurate, if artificial, natural surroundings, which is, of course, an additional charm to the photograph; but we think that in some cases—as he does also—that it is as well to photograph a living animal on a homogeneous background to show it up better. Thus Dr. Leighton photographs his living adders by allowing them to move about on a large sheet of white blotting-paper until the correct moment for exposure. This book deals in turn with apparatus, the photography of mammals, birds, reptiles, fish, insects, pets, decorative natural history work, and other practical matters, and all the instructions are admirable. We search for the amphibians in vain as such, but, to our surprise, find them under the name of reptiles, an error to be rectified, we hope, in the next edition of this excellent manual of natural history photography.

THE NATURAL HISTORY OF ANIMALS. By Professor J. R. Ainsworth Davis, M.A. London: The Gresham Publishing Co. Half-vol. ii. Price 7s.

In our last issue we set forth the general plan of these volumes, and we have now received the second, completing volume i. The first half-volume dealt with the classification and characters of the Vertebrates, beginning with man and going down the scale as far as the Amphibians. In the second half-volume before us the fishes and primitive Vertebrates are described, and then the whole of the Invertebrates, beginning with the Worms and ending with the Protozoa. Since the series when complete will be a work of reference for the whole subject of animal natural history, it is perhaps of comparatively little importance in what order the various types of animals are considered. For teaching purposes, however, we think it is of great importance that the student should be led from the simple to the complex rather than *vice versâ.*

The two half-volumes now completed review in brief the entire animal kingdom as a necessary preliminary to the study of the food of animals, the defences, and other aspects of life to be considered in the succeeding volumes. Already, however, many comparisons have been drawn attention to in illustration of general principles, and particularly has our author indicated the affinities between related groups. Thus the principal characters which cause the birds and reptiles to be associated under the one term Sauropsida are contrasted with those which place the amphibians and fishes together in the Ichthyopsida. This is only one instance of the useful character of the work to non-specialist readers. Of the illustrations by far the most useful to our mind are the diagrammatic drawings, some of which are excellent. We wonder if Professor Davis has verified for himself the statements on p. 194 explanatory of the ease with which the tail of some lizards is broken, as in the slow-worm, for instance. We have found the fracture in *Anguis fragilis* and *Lacerta viridis* to be due to other causes than the supposed lack of ossification in the centre of the vertebræ, but the explanation here given is the orthodox one found in all text-books, and presumably copied from one to the other. We must protest against the statement that the "sand lizard (*Lacerta agilis*) is commonly found on sunny slopes in this country" (p. 190), the distribution of this species being very limited even in those counties south of the Thames, and distinctly limited elsewhere. Neither do we quite agree with the general statement that reptiles are in the main sluggish, though that, too, is the common opinion. Our experience is that *any particular movement* in most reptiles is carried out with as great rapidity, and sometimes with lightning speed, as is the case in similar movements of birds and mammals. If anyone doubts this let him set free a sand lizard or a common viviparous lizard on a lawn and try and catch it. It is excellent exercise, but the result is disappointing.

We have always maintained that photographs are better than coloured plates for illustrating lizards, for the simple reason that the extent of colour variation in them and also in snakes is so great that even an accurate representation of one specimen is of no value as a standard from which to judge the whole species. The coloured plate of lizards in this volume confirms this view.

The best part of this half-volume is that on the Insects. Here the diagrams and other illustrations are good, the classification simply described, and the life-histories useful.

We look forward with interest to the succeeding volumes, which, being on less morphological subjects, will perhaps be of still greater interest to field naturalists.

VARIATION IN PLANTS AND ANIMALS. By H. M. Vernon, M.A., M.D. London: Kegan Paul, Trench, Trübner, & Co. Price 5s.

There are few subjects which are attracting so much attention at the hands of biologists nowadays as that indicated in the title of this book. With each year a greater and more complex mass of facts and experiments is recorded, and it is difficult, indeed, for the non-specialist to keep himself anything like up to date. Also the subject gets more and more technical and distinctly more mathematical. So that we welcome Dr. Vernon's endeavour to give a brief account of the subject of Variation so far as the present state of our knowledge admits. Variation in animals is dealt with more fully than variation in plants, and no fault will be found with the author for the prominence given to his own researches. The book is divided into three parts, which deal with the Facts of Variation, the Causes of Variation, and Variation in its Relation to Evolution, respectively. We have no intention of entering upon a detailed criticism of the contents of these sections, which would be beyond the province of a review in this Journal, but we have great pleasure in drawing the attention of those of our readers who are interested in these problems to this book, because here they will find in a comparatively small compass a great deal of the most modern thought on the important questions involved, set forth, moreover, in a manner which the intelligent field naturalist will readily comprehend, which is more than can be said for some writings on Variation. It is a book to be carefully read and studied, and one which will be a useful reference volume for the general reader for most of the facts of the subject.

MY NATURE NOTEBOOK. By E. Kay Robinson. London: Isbister & Co. Price 2s. 6d.

Mr. E. Kay Robinson is so well known as a writer on current nature topics in *Country Life*, the *Outlook*, the *Daily Graphic*, and now—we are glad to be able to add—the *F. N. Q.*, that he must be by this time fairly sure of an audience. We need, therefore, merely draw the attention of our readers to this little volume from his pen, which is, as he says, a cursory record of one year, week by week, of those phenomena which came under his own observation, and which may likewise be observed by others at similar periods of the year. Mammals, Birds, Reptiles, Amphibians, Fish, and some Invertebrates, all come in for mention in one or other of the fifty-two weeks of notes, and in order to encourage observation on the part of his readers, the author has added a number of blank pages at the end of the book which they can fill up for themselves. Whether writing of plant or animal, Mr. Robinson is always interesting, because he writes of what he sees out of doors, and also because he reasons pleasantly and not too learnedly therefrom. Field naturalists will read this book with pleasure and profit.

OPEN-AIR STUDIES IN BIRD LIFE. By Charles Dixon. Illustrated by Charles Whymper. London : Griffin & Co. Price 7s. 6d.

The author of this useful volume is by no means unknown to those interested in ornithology, and his previous publications on *Rural Bird Life*, the *Migration of Birds*, and other subjects of like character are doubtless familiar to our readers. In the present book Mr. Dixon's object is to "furnish a popular introduction to the study of ornithology by visits to British birds in their homes." Almost every bird indigenous to our isles has been included, and each is noticed under the special haunt to which it seems specially attached. The method is a good one, and serves to associate in the mind of the reader those birds which are to be found under the same conditions. At the same time classification is not neglected, so that at least two aspects of the birds are dealt with. But this is by no means all that is given, for many important points in structure and physiology are carefully and accurately stated. Our author has wisely restricted himself simply to giving sufficient information relating to the birds of our country to serve as an "introduction to a wider study of a very fascinating subject," and in our opinion he has formed an accurate estimate of what such an introduction should comprise. Mr Dixon states that the missel-thrush feeds "not in any way specially upon the berries of the mistletoe, as is popularly supposed," with which statement we concur. The present writer lived for years in the midst of mistletoe and in a locality where the missel-thrush was common, and he could never satisfy himself that this bird had any preference whatever for these berries. There are many observations we should like to quote from this book, but space forbids. Our readers will enjoy finding them for themselves.

THE PRIMROSE AND DARWINISM. By A Field Naturalist. London : Grant Richards. Price 6s. net.

The author of this work, which was published last year, decided to remain anonymous, doubtless for reasons which he considers good. At the same time we cannot but think that a writer who sets out to convince his readers that a vast number of Darwin's experiments led him to fallacious conclusions would have carried more weight in the scientific world if he had added his name. The impression left on our mind after reading the book is that our author considers that Darwin attempted to make his observations square with his own theories, that the observations themselves were of little or no value, that Darwin himself refused to see things which would have led him to other conclusions, and that on the whole his work on fertilisation is something worse than useless except to promote further research. Our author even doubts that cross-fertilisation is a great part of nature's scheme, and concludes that Darwin's method of investigation "not only misled himself as to facts of nature, but his conclusions drawn from such methods of investigation have misled for an entire generation those of his ablest followers, who, without questioning, accepted his method and conclusions." Our readers who are interested in the question can take one of three courses. They may prefer to take the opinion of an anonymous writer to that of Darwin ; they may compare Darwin's experiments with their own observations ; or, thirdly, and best of all, they may experiment and observe for themselves, and in the light of all that science now teaches—much of it the direct result of Darwin's marvellous genius for patient observation—they may draw *their own conclusions* and compare them with his.

ANALYTICAL PSYCHOLOGY. By Lightmer Witmer. Ginn & Co. Price 7s.

This work of over 200 pages is intended to instruct in the Science of Experimental Psychology the mental student in general and those preparing for the teaching profession in particular. Unfortunately the Normal Colleges of Britain pursue this subject on what has been satirised as The-look-and-say Method, *i.e.* look at the text-book and find the answer to the given question. Naturally the "authority" studied waxed in years, but never grew old ; and made room for better men only after the revolutionary process brought about by the death of a college lecturer or the fiat of some captious H.M.I. Possibly (we have our doubts) Mr Witmer's book may do something inside our Normal Colleges and Universities to assist the pioneer work done by Professor James in the field of Experimental Psychology. The education of a teacher is impossible without such a course.

The outside public must be vastly benefited by this text-book, and we have no doubt that among the teachers, who read it, and we strongly recommend all to do so, there will arise many who will own to its putting them on the lines of observation for themselves. The book will certainly break down much of the ingrained habit of mere book-learning, but will do more : it will show how to construct a sound fabric in place of the card house destroyed. Crammers will pass this book as of no use to them : it certainly is not suited for cramming. The experiments are simple, and the necessary apparatus cheap ; on this account the delights of the study are open to all.

To one who has had any experience of the difficulties of teaching reading, writing, spelling, and drawing to children, the first hundred pages will go a long way towards creating a sympathetic understanding of the natural reasons for the difficulties raised by his pupils. When adults discover that the sense of sight in themselves can be juggled with by the appearance of letters, words, lines, and figures, a better appreciation of the laborious work of the teachers will be attained.

The diagrams and charts are numerous and efficient for their purpose, and the value of the work is enhanced by the fact that it is constructed from a course of practice with Normal College students in America. We do not agree with the author in all his conclusions. That "the contraction and expansion of the pupil are not under voluntary or even conscious control," is, in our opinion, contrary to experience. We admit the truth of the statement as limited to childhood before the subject has experimental knowledge with which to make the apperception of a "distant" object and to complete the reference; but in regard to adult experience the sensation of adjustment of the eye-mechanism is one of the best guides to judging distances. In æsthetics, again, we suggest that the agreeableness of certain divisions of a number of equal verticals (Chart 23) is due rather to experience, the act of preperceiving a line divided as a sword is between blade and handle; or again as suggested by the foreshortening of perspective in upright objects subdivided equally and viewed from a near standpoint below. Speculatively, we would suggest that "exploitation" of an appearance "from left to right and back to left" may not be preferred by Orientals, who are accustomed to reading from right to left and from bottom to top. But this is hypercriticism.

Out of a book written with uniform skill it is difficult to particularise; but no one could read the sections on the eye, vision (binocular, monocular, and stereoscopic), and illusions of sight without deriving pleasure and profit. We heartily commend the work.

CONTEMPORARY NATURAL SCIENCE PERIODICALS.

KNOWLEDGE has been even more than usually interesting to the natural history student during the last quarter, and we would particularly draw attention to the July number, in which the article entitled "Familiar British Wild Flowers" (R. Lloyd Praeger) is the fourth instalment of that series. The Compositæ are the flowers dealt with last. Mr. Stebbing continues his papers on "The Nobodies," the sea-insects; while the column of "Notes" contains an interesting summary of the evidence on the question, "Do Whales Sleep?" The astronomical part of the journal is, as usual, prominent.

NATURE STUDY for June contains the abstract of a paper by Mr. Webster, Secretary of the St. Helens Naturalists' Society, on the "Folklore of Insects," as well as the conclusion of E. W. Swanton's paper on "Colour Changes and Structural Modifications."

BIRD NOTES AND NEWS devotes its July issue to the trade in "osprey" plumes, which it describes under the heading, "The Biography of a Lie." The lie is, of course, the assertion made by some dealers that the plumes they sell are all artificial and manufactured out of material other than egret feathers. These articles do good, as we recently had a letter from a lady who said that in consequence of something she had read in the columns of the *F. N. Q.* she would not wear "osprey" plumes in future. We think it is quite certain that if the matter were more generally understood, the fashion would die out in time to save the birds from extinction.

THE AMERICAN NATURALIST for March contains a most instructive article from the pen of G. H. Parker on the "Sense of Hearing in

Fishes," in which is discussed the parts played by the ear, the skin, and the lateral lines in the production of sensation. As the result of some most interesting experiments Mr. Parker carried out, and which are detailed, he concludes that the ears of certain fish are stimulated by sound-waves, that is, that the fish hears. At the same time, he is prepared to believe that there are fishes in which the sense of hearing is undeveloped. The writer regards the skin as representing the first generation of sense organs, this giving rise to the lateral-line organs, which thirdly produce the ears. The internal ear he regards as a modified part of the lateral-line system.

THE NATURALIST for July contains some excellent articles, among which may be mentioned that by Dr. P. Q. Keegan on "The Chemistry of Some Common Plants." Mr. T. Sheppard continues his series on "Hull's Contribution to Science," which is a short biography of the most famous scientific sons of that city. The Rev. W. J. Wingate writes on "Durham Diptera," of which he gives a list comprising 559 species and varieties which he has taken and identified. Mr. W. Cudworth gives an illustration and description of a fossil tree at Bradford; Mr. R. H. Philip, a note and illustration of some "Diatoms in Hotham Carrs"; Mr. J. Braim writes on the "Pied Flycatcher in Yorkshire"; Mr. Henry Preston, on the "Geology and Archæology of the Caythorpe and Leadenham District"; Mr. C. F. George, on a "Lincolnshire Freshwater Mite"; and there is a full report of the doings of the Yorkshire Naturalists at Filey, with a photograph of the party present on that occasion.

In the ANNALS OF SCOTTISH NATURAL HISTORY for July Mr. Cash appeals for greater protection for Scottish ospreys, an appeal with which all naturalists will sympathise. Mr. John Robertson publishes his paper on "The List of Birds in the Island of Bute," the number of species recorded being 138; Mr. T. G. Laidlaw continues his report on the "Movements and Occurrence of Birds in Scotland during 1902"; Mr. Percy Grimshaw writes Part III. of his "Diptera Scotia," the district dealt with being that of the Forth. Botany is represented by "Notes on the Flora of Western Ross-shire," by G. Claridge Druce; and the "Hepaticæ of Lochcarron District (West Ross-shire)," by Mr. Macvicar. Professor Trail writes on "Scottish Perisporiaceæ"; and an excellent number of this journal concludes with the usual short notes on Scottish zoology and botany.

Field Clubs and Societies.

THE Woolhope Naturalists' Field Club have issued another volume of *Transactions*, including the work of the club for 1900–1901, to April 1902. It seems, therefore, somewhat late in appearing. The *Transactions* under notice make a volume of 315 pages, and is lavishly illustrated by some 44 full-page illustrations from photographs and drawings. As usual in this society the papers are of great interest and high merit, and testify to a large amount of good work done by the members, as well as to great care and labour on the part of the secretary and editorial committee. One of the most interesting contributions is that by the Dean of Hereford, on "Some Archives and Seals of Hereford Cathedral," with photographs by Alfred Watkins. Another paper of interest to Herefordians especially is that by Mr. Carless on "Hereford City Insignia and Plate." In addition to a number of archæological papers of great local interest, there are papers on various points in the entomology, ornithology, ophiology, geology, botany, and meteorology of the county. The volume is most tastefully got up, and is a valuable one from every point of view. The report of the assistant-secretary for 1902 showed an increase in number of members and income, attaining a record. The membership was 240, including 20 new members.

We have received the *Annual Report and Transactions of the North Staffordshire Field Club* (1902–1903, vol. xxxvii.). It shows a membership of 461, a most gratifying state of affairs. Of the papers contributed we specially wish to refer to one, that on "Heredity and Evolution," by Mr. H. C. Reeve. Our readers are aware that we have been contending in this journal that it is the duty of field club officials to see that great questions of biological significance are brought before members for instruction and discussion, and our correspondence columns have borne testimony to the wishes of field naturalists themselves in this matter. It is therefore with great pleasure that we find this society discussing a paper of this kind, and we are quite sure that it must have been one of the most interesting meetings of the year. In the zoology section Mr. Masefield draws attention to the results of Mr. Adams' investigations into the structure of the mole's fortress, which show that no two of these fortresses are alike in construction, and not one tallies with the time-honoured and symmetrical figure of St. Hilaire. Mr. Adams concludes also that the mole has only one litter annually, between the latter part of January and the end of April, though occasional litters are born in August and September.

The Manchester Field Naturalists' and Archæologists' Society have issued their *Report and Proceedings* for 1902, the forty-third year of the society. They are edited by Mr. Leo H. Grindon, who records "the unbroken happy life of the society, and the consistency and success with which its objects have been followed up." Those objects are set forth as being an endeavour "to diffuse and encourage earnest and intelligent love and interest in the simple and common" things which are around us, rather than research in departments of science. As a society we think the objects are exactly what they should be, research is for the individual, the diffusion of knowledge for the club. The membership is returned at 192, and the excursions were well attended.

The Caradoc and Severn Valley Field Club have sent out their *Record of Bare Facts* for the year 1902. This is an annual list of the more noteworthy observations made by members of the Society and others during the year, and forms a very valuable means of reference to the fauna and flora of the localities worked. The botanical lists occupy no less than 32 pages, and it is evident that there are several painstaking botanists at work on the flora. The records are completed by those of zoology, geology, and meteorology.

The Essex Field Club now issue their journal, *The Essex Naturalist*, quarterly, in April, July, October, and January. The price is 5s. per part to non-members, but free to members of the club. The April issue contains, amongst other matters of interest, a proposal for carrying out a pictorial survey of the county, by means of enlisting the services of local photographers. The plan is an excellent one, and has already been adopted, if we mistake not, by some other field clubs. It is just one of those ways in which a field club can make records of the greatest value to the future local historian.

"The Lepidoptera of Cheshire, etc.," compiled by George O. Day, F.E.S., and others. This list is the outcome of the excellent work done by the members, and is published in the *Proceedings of the Chester Society of Natural Science*, and it certainly is a vast improvement upon that of Mr. A. O. Walker, published in the same *Proceedings* eighteen years ago. It embraces all the moths and butterflies which are known to occur in the counties of Cheshire, Flintshire, Denbighshire, Carnarvonshire, and Anglesea, together with exact localities and interesting notes on mode of capture, date of appearance, etc., the latter being noticeably later than in the more southern English counties. The present compilation ends somewhat abruptly at the beginning of the tortrices, and we are told in the preface that, although the remaining groups were originally intended to be included, the records from the Welsh counties were so meagre that it was eventually thought better to reserve their publication till more material had been compiled. We think this an error, especially since those from Cheshire are said to be fairly numerous, for a list of their nature can at best be but a stepping-stone to future improvement, and every pebble is of assistance to the student, who is almost invariably more eager to add species to an existing catalogue than to build up one for himself. The bibliography of the geology, climatic conditions, and flora of the district is a distinct boon, and one that might be advantageously emulated in other local lists; the entries are very fully annotated; the type good and particularly free from printer's errors.

THE DARLINGTON AND TEESDALE NATURALISTS' FIELD CLUB. —On 28th April Mr. T. W. Watson presided over the annual meeting, held in the Mechanics' Hall, and the balance-sheet and report showed the club to be in a prosperous condition. The president, in the course of an interesting address, reviewed the important events that had occurred in the scientific world during the past year, making reference to wireless telegraphy and the progress in methods of timekeeping instruments, mentioning particularly a clock, the invention of Invan. An alloy of steel and nickel, it was stated, had a very small coefficient of expansion, and was invaluable for pendulums. Dealing with astronomical matters, he said that four new comets were discovered in 1902. As regarded the club, several interesting gatherings had been held. The late Dr. Manson's books had been purchased and added to the library. Numerous specimens of plants had been brought in and named. Mention was also made of the excursion to Forcett, promoted by Mr. Edward Wooler, when the club visited the site of what was believed to be an ancient British encampment, extending from the Swale to the Tees, and of which a large portion of the constructive parts yet remain. A number of valuable papers had been contributed during the year. On the proposition of Mr. Wooler, seconded by Mr. Ord, a hearty vote of thanks was passed to Mr. Watson, the retiring president, for his instructive address. Mr. James Wilson, of Newlands, was elected president for the ensuing year, and the officers were re-elected. Mr. G. Best was again asked to discharge the duties of hon. secretary, and a cordial vote of thanks was extended to him for his services, extending over many years. It was suggested that, as a reward for his many services to the club, a piece of plate or suitable article of furniture, should be presented to him. Mr. Robert Smith called attention to the fact that a huge boulder had been discovered on the Cliffe Estate by Mr. Lear. The boulder was of Shap granite, measuring 9 feet by 6 feet 10 inches by 5 feet 3 inches, being the largest glacial boulder yet found in the neighbourhood of Darlington.

On 2nd May the members of this club had a very enjoyable field day, beginning at Greystone Farm, near Manfield, and then proceeding to Cliffe, where the newly discovered granite boulder is situated. Messrs. E. Wooler, Turnbull, and others directed the digging operations in order to get the full size of the boulder, which proved, on measurement, to be 9 feet by 7 feet 8 inches by 6 feet 6 inches—Shap granite. Messrs. Smith and Cleghorn took the bearings and full particulars of both the Cliffe boulder and also the one at Greystone, which is supposed to be a "Rhyolite," from Shap. The Rev. Mr. Wingate and Mr. W. J. Mountford photographed the large boulder. The botanists, under Mr. Wingate and Mr. T. M. Thompson, had an enjoyable ramble, and reported finding *Gagea lutea*, yellow gagea; *Lathræa squamaria*, toothwort; *Chrysosplenium oppositifolium* and *C. alternifôlium*; golden saxifrage. Several rare birds and insects were noted by Mr. Geldard. At the usual meeting held on Tuesday evening, Mr. Wilson, the president, in the chair, the investigations made at the excursion were recorded. On the motion of Mr. Ord, and carried unanimously, it was decided to elect the Rev. W. J. Wingate as honorary member of the club. Mr. Ord showed a fine fossil orthoceros pyramid, found in carboniferous limestone at Frosterley.

Mr. Smith showed some of the dust from Mount Pelee, which fell in the island of St. Lucia, presented by Mr. Chris. R. Robinson. Two new members were elected.

Just as we go to press we have received a copy of *The Birds of Bempton Cliffs*, by E. W. Wade, which has been reprinted in pamphlet form from the *Transactions of the Hull Scientific and Field Naturalists' Club.* It is excellently illustrated, and has evidently been produced at considerable expense. We trust, therefore, that those who are interested in the bird-life of the district will support the club by purchasing the booklet. The cost is two shillings. Mr. Wade is to be congratulated on his nineteen photographs. One of the best is that which represents Mr. J. Hodgson down Raincliffe, exploring the bird-life of that precipitous cliff. The descriptions of the methods and dangers of these climbings are of great interest.

Correspondence.

Rutland Birds.—" May I be allowed to criticise, in a friendly way, some points in the paper on 'Rutland Birds,' by your contributor Mr. R. Haines, M.B.O.U.

" So much has been written on the vexed question of the supposed present scarcity of some birds, and abundance of others, and the evidence generally offered is so conflicting, if not obviously insupportable, that one wonders whatever the twenty-first-century naturalist will do when he attempts to sift the fact and fiction which he will have to wade through if he should endeavour to ascertain anything about the bird-life of England prior to his generation.

" Now, of all our small birds commonly supposed to be rare, or even approaching extinction, none has been quoted oftener than the goldfinch, the reasons offered being, firstly, the bird-catcher; and secondly, as Mr. Haines says, 'high farming and the cultivation of waste lands.' If this be true, and I for one do not doubt it, and the process of extermination has gone on for so many years, and *yet* this bird 'is so common' (I use Mr. Haines' own words), 'now that it is no unusual thing for one small orchard of an acre or less to have one hundred young birds reared in it,' the coming ornithologist will certainly wonder how many goldfinches there were to the acre of orchard in the good old days.

" Taking another of the small birds, which, as your contributor says, 'abound in every covert,' and whose numbers even now, in these most degenerate days of ornithologists *and* egg-collectors, it is 'impossible to estimate,' the linnet, Mr. Haines tells us, is so common in his district that in the furze 'there is a nest to every three bushes.' Personally I have found ten *other* species of birds nesting in furze bushes, and there are several others that I have *not* found. If other birds than linnets nest in the furze bushes of Rutland, and the linnets alone now take one bush out of every three, how will the different species find nesting accommodation when we obtain the 'special legislation against ornithologists and egg-collectors,' which Mr. Haines desires, and doubtless thinks would greatly increase these small birds' numbers?

"Next, the nightingale, about which we are told that there are two *pairs* in the immediate neighbourhood of Uppingham. How many pairs of nightingales ought we reasonably to expect to be in the immediate neighbourhood of any town? And what about the other *commoner* warblers, the whitethroat, willow-wren, etc.—a dozen or more species? Really one wonders that so many escape the collectors, the crows, and the cats; and imagination fails to conceive how these little favourites found room for existence in their palmy days.

"Most of our birds of prey having been sacrificed to 'pheasant worship,' the heron to angling, and with the raven utterly exterminated from English counties, Mr. Haines yet would have us destroy four-fifths of the numbers of the family Corvidæ. I should like to know if, under such circumstances, it would then be a criminal offence for a collector to take the eggs of any of these species, say the chough for example. Perhaps not, if the collector took them to boil hard and eat cold.

"But the egg-collector may take further comfort, for it is not suggested that the eggs of the peewit should have other than partial protection, although this bird now 'suffers from the taking of its eggs.' Possibly, however, the collector would only be allowed to take these eggs for the 'table'; and here we see where there is a 'morale' even in egg-collecting.

"I, though a collector, love nothing in nature so much as birds, and find no more to criticise in Mr. Haine's paper than in most other contributions to the Natural History press, which are now mostly on a par with the articles inserted in the Angler's Column of a country newspaper. As 'criticism is the life of science,' I hope my remarks may not be considered out of place in a journal devoted to subjects which should only be considered with the strictest regard for the sacredness of scientific accuracy."—W. GYNGELL, 13 Gladstone Road, Scarborough.

[We should be very glad to think that the Angler's Column of a country newspaper was on a par—as regards the matter contained—with the articles in the *F. N. Q.* We hope it is so.—ED. *F. N. Q.*]

Fossorial Hymenoptera.—"On page 29 of the *F. N. Q.* (No. 5), Mr. Oswald H. Latter, in the course of his article on 'Fossorial Hymenoptera,' asks an interesting question. After remarking that in his investigations of the larders of certain Pompilidæ he invariably found the egg occupying one certain position on the abdomen of the paralysed spider destined for the larva's food, he inquires, Why this position? By way of possible answer, he hazards the suggestion that in this position (the anterior dorsal surface of the right side of the abdomen) the egg is fairly inaccessible to the legs of the spider, should the latter recover from the effects of the sting.

"A solution to the mystery will be found in the work of 'that inimitable observer,' the French naturalist, J. H. Fabre, an admirable translation from whose fascinating writings, under the title of *Insect Life*, was published not long ago by Messrs. Macmillan. In chapter viii. (p. 102) will be found the result of Fabre's experiments with the larvæ of two species of Sphegidæ, hatched respectively upon the paralysed body of an ephippiger and similarly helpless carcasses of crickets. Briefly, as the result of surgical investigations with a needle, he found that, whereas the paralysed victim, when probed elsewhere, was sufficiently susceptible to pain, or touch, as to respond with a convulsive movement violent enough to jerk a helpless grub from its cradle, yet in the thorax upon which the egg reposed, and into which the disabling sting had been plunged, no power of sensation was left. Thus, no effect would be produced by the first gnawings of the grub at this spot, nor would any attempt at resistance on the part of the victim be evoked until the attacking larva was both so far embedded in the carcass, and of sufficient strength as to be able to defy any effort to dislodge it.

"As with the *Sphex* under Fabre's observation, so, it is reasonable to suppose, with Mr. Latter's *Pompilid*.

"If not already acquainted with the book, Mr. Latter will find not a little of extreme interest upon the subject of Fossorial Hymenoptera, as well as insects of other orders, in *Insect Life*. He need be no entomologist, however, who would appreciate both the actual work of the great French observer, and his exquisite manner of expressing it in words. No dry-as-dust scientist is he ; and even to those not altogether unlearned in insect lore, some of the results of his intense and patient observations must come as a stunning revelation.

"Incidentally, it is interesting to note (in connection with Mr. Latter's remark upon the powers of memory displayed by a *Pompilid* in taking prey to a burrow) that Fabre, though at first inclined, by the astonishing examples he witnessed of what he terms the 'science of instinct,' to an opposite opinion, eventually decides to his own satisfaction (and, we think, to his reader's also) against the possession of reason by insects. At the conclusion of his chapters on 'The Science and Ignorance of Instinct,' he sums up the arguments for and against as follows :—

"'Instinct knows everything in the unchanging paths laid out for it ; beyond them it is entirely ignorant. The sublime inspirations of science, the astonishing inconsistencies of stupidity, are both its portion, according as the creature acts under normal conditions, or under accidental ones.'"—A. E. JOHNSON, London.

The Duty of Field Clubs.—"I am quite sure that in many ways the *F. N. Q.* is proving itself a real help to members of field clubs, and I am equally certain that almost the best thing it has done for them yet is to open its columns to the ventilation of this question. There is one point which has so far not been touched upon either in your editorial or in the letters you have published, and which I should like to draw attention to. I believe that one great reason why our field clubs, to a certain extent, fail in their purpose is to be found in the fact that occasionally they fritter away their time and energy in aimless observation of anything and everything which comes to hand, instead of setting themselves to make complete records of the fauna, flora, and objects of archæological interest in their special district. Of course, I know that some clubs do this, and these are the clubs which flourish and do good work. But in many instances there is absolutely no definite plan of work set before the members, and, still less, plan of instruction. It only requires that this should be altered on the lines suggested to make every field club the highest authority on the scientific objects in its own district, as it ought to be. We should then have fewer errors in our text-books, and the would-be author on these subjects would know that the information he wants is to be found chiefly in the records of the local scientific societies, which now he may often search in vain for the information he requires."—"ANOTHER FIELD NATURALIST."

Concerning Pythons.—"Having had considerable experience with the python tribe, it may be of interest to state that it is only when hungry that pythons and their kindred constrict, and use that mighty and fearful power which nature has given them. I have never known an instance in which a python has used constriction as a means of attack or defence, except when seized by the hands round the neck or head. The python always comes for you with his teeth, and hits you with his head. Rats have been known to kill a valuable serpent simply because the reptile was not hungry. But when hungry it will always wrap itself around the victim, crushing the latter to death. I was once a witness of a little tragedy that may bear repeating. I was on excellent terms with an anaconda on a man-of-war, stationed in the West Indies. My friend had been captured in Trinidad. She, for the snake was a female, got to know me very quickly, and we got on famously together, till one fatal day when a large retriever dog approached her. In the twinkling of an eye she was around him, and he was dead. Ever afterwards my pet could never be handled with safety, for she would slap one so unmercifully across the body that on one occasion she broke three of my ribs. After that she was enclosed in a large tank until she finally died."—CHAS. F. WHEELER, 30 Wyndham Street, London.

Rutland Birds.—"In answer to your correspondent, Mr. C. E. Reade, I beg to say that the birds he mentions are members of our fauna. I did not mention them (and others) specifically in my paper because I had no data as to their having increased or diminished. The marsh-tit is fairly common, long-tailed tit quite common, chiffchaff not very abundant, coot only in a few localities. The tree-sparrow I should have included, as I imagined I had done. This bird is common in Rutland."—REGINALD HAINES.

The Language of Birds.—"Mr. E. Kay Robinson's striking paper on this subject deserves a response from everyone who can add even the smallest particular to the facts given. The 'croak' of the nightingale, I think, deserves notice among the various cries. This denotes alarm, perhaps indignation, and may be a signal to the female when sitting. The woodpecker also hisses when found sitting on the nest. The scolding 'churr' of the wren is also perhaps worth mentioning."—REGINALD HAINES.

Wood-Pigeons in London.—"A somewhat remarkable instance of wild birds breeding within the City of London is afforded by the wood-pigeons of Soho Square. I am informed by a gentleman whose business takes him daily to the neighbourhood of the square, that this year three birds have frequented the trees in the centre garden. One of them I have myself seen. Neither this year nor last year, however, have there been any nests discoverable. But in 1901 one nest was to be seen in the square, while in 1897 no less than six could be counted. For a bird ordinarily so shy as the wood-pigeon to breed, not merely in London, but within a literal stone's-throw from the turbulent corner where Oxford Street, Tottenham Court Road, and Charing Cross Road meet, is surely somewhat uncommon."—A. E. JOHNSON, London.

The Natural Attitude of Puffins.—"I read with much interest the remarks on the position of the puffins as shown in my photos (see last issue of the *F. N. Q.*), and so far as I could judge the birds showed no sign of anything except curiosity at the time, certainly nothing of alarm. I enclose three other photos taken about the same place for your inspection. I think you will agree with me that out of the six birds in the one photo, five are certainly clear of their tails and standing as my other photo represented them. The solitary bird has a good use of its legs also. I trust these may be of further interest."—THOMAS TAIT, Inverurie.

[We quite agree that the photos show the birds as Mr. Tait describes. The point is of much interest.—ED. *F. N. Q.*]

"As you invite correspondence from those who have observed these birds in nature, I venture to send you some photographs taken by myself with a telephoto lens on Ailsa Craig, the birds being at such a distance from the camera as to be at ease.

"I am of opinion that the puffin does not as a rule, or even often, sit in an upright position, as represented in many plates, with the metarsal bones resting on the ground (like the razorbill and the guillemot), but either stands, or rests, in the ordinary bird fashion, as in my photographs. I send also an enlarged photograph of razorbills and guillemots, which shows this upright position of the birds very well."—Rev. H. HOLROYD MILLS, M.B.O.U., Trelothan, Cornwall.

[The photos bear out what Mr. Mills states.—ED. *F. N. Q.*]

Answers to Correspondents.

G. B. S., Dublin.

The three-toed echidna comes from New Guinea, the recorded specimens being from the north-western regions of that country. It inhabits rocky ground in the mountains. The specimens first described were obtained at an elevation of 3500 feet. The Papuans capture it by digging trenches in the ground about a yard deep, by which means they generally come upon its runs. (*Mammals, Living and Extinct*, p. 127. Flower and Lydekker.)

E. G. M., London.

The Alpine ibex (*Capra ibex*) is about 2½ feet high. Hair is short and smooth in summer, of grey colour; in winter a longer coat is grown. Horns 2 feet, shorter than those of the Himalayan ibex.

Piscator, Hull.

By a domesticated fish is meant a species which can be bred in captivity, and which is capable of transportation within certain climatic limits. The carp and tench are examples. Artificial impregnation of fish ova was first practised by Jacobi, a native of Westphalia, in 1757–1763, who employed the same method followed now. (*The Study of Fishes*, p. 186. Gunther.)

S. H., Sydney.

The Megapodes, or mound-builders, are amongst the most remarkable birds found in Australia. The vegetable and other débris is thrown up by a backward movement of the powerful hooked feet, and it has been shown by actual observation (*Proc. Zool. Soc.*, xliv. 117) by Mr. Ramsay that several females visit the same mound. This co-operation had long been suspected from the large number of eggs, as many as would go to a bushel, found in some of the larger mounds. Curiously enough, this had been denied by the aboriginals. The circumference of the mounds at the base is in some cases as much as 30 feet. In the warm interior of these incubators are laid the long thin-shelled eggs, placed in a ring, no two in contact. (*Natural History of Australia.* F. G. Aflalo.)

Moth, Swansea.

Both the red admiral and the painted lady may be taken in August on fruit or ivy blossom, but the latter species is more common in September. When a branch is shaken some larvæ are loosened and fall, others adhere more tightly, *e.g.* that of the puss moth.

Young Naturalist's Quarterly Competition.

In order to encourage the study of natural history and other scientific subjects, the Editor offers prizes every quarter for the best essays sent to him on the prescribed subjects. The competitions are open to all young students and scholars, and are specially intended for the pupils of public schools, colleges, etc., which have natural history and other societies for their scholars. Competitors must send their essays in their own handwriting, together with a statement from their headmaster or clergyman certifying the essay to be the original and unaided work of a competitor under nineteen years of age. Essays should not exceed 1000 words, but may be as short as desired. In awarding the prizes, the Editor, whose decision is final, will take into account both the accuracy of the matter and its arrangement. The result of the competitions will be announced in the following quarter's issue. The successful competitor must then select his or her prize from those offered, and inform the Editor at once where the prize is to be sent to.

The Editor reserves the right to publish any of the essays sent in.

Note.—The subject for the next quarterly competition is, "**Natural History Observations in the Holidays.**"

Competing essays (with statement of age and originality) must reach the Editor of the *Field Naturalist's Quarterly*, 17 Hartington Place, Edinburgh, on or before October 15, 1903. Envelopes to be marked "Competition Essay." The prizes will be announced in the next issue of this Journal. First prize, any two of the following books; second prize, any one of them:—

School of the Woods (Long).
Beasts of the Field (Long).
Fowls of the Air (Long).
British Vertebrates (Aflalo).
A Year with Nature (Westell).
Fauna of Shropshire (Forrest).
British Serpents (Leighton).
The Vivarium (Bateman).
Open-Air Studies—Geology (Cole).
Nature Studies—Botany (Scott Elliot).
Norfolk Broads and Rivers (Davies).
Photography for Naturalists (English).
Field Naturalist's Handbook (Wood).
Etc. Etc. Etc.

Notices.

TO CONTRIBUTORS AND CORRESPONDENTS.

ALL articles and other communications (typewritten if possible) intended for publication, and all books, Transactions, papers, etc., for review or other notice, should be sent to the Editor, *Field Naturalist's Quarterly*, 17 Hartington Place, Edinburgh.

Business communications should be addressed to George A. Morton, Publisher, 42 George Street, Edinburgh.

Contributors are requested to write the department to which their communication refers (*e.g.* Ornithology) on the envelope.

Every effort will be made to return unused communications where stamped addressed envelopes are enclosed for that purpose, but contributors are advised to keep copies of their MSS., as the Editor cannot undertake responsibility for their non-return. Photographs or other illustrations sent for publication must be original, and the absolute property of the sender.

The full name and address of the sender must accompany every communication. Anonymous communications will not be noticed. Correspondence is invited on all matters of general interest which fall within the scope of work usually done by field clubs and kindred societies. Original observations on the habits of living animals and plants will be specially welcomed.

The *Field Naturalist's Quarterly* is issued in February, May, August, and November; and all communications for the ensuing issue should reach the Editor at least one month in advance.

To Subscribers.

The annual subscription to the *Field Naturalist's Quarterly* is 10s. post free. Single issues, 2s. 6d. net each. Subscriptions, which may begin with any issue, should be sent to the publisher, George A. Morton, 42 George Street, Edinburgh.

The *Field Naturalist's Quarterly* may be ordered direct from the publisher, or through any bookseller or newsagent.

Copies of Nos. 1 to 6 of the *Field Naturalist's Quarterly* can still be obtained by new subscribers who wish to have the first two volumes complete.

Cases, in green art linen, for binding volume i. of the *Field Naturalist's Quarterly*, may be obtained from the publisher, price 6d. (post free 7d.). The publisher is also prepared to bind volume i. in the above style at 9d. per copy (including postage, 1s.).

To Advertisers.

Applications for terms and spaces to be sent to the publisher, George A. Morton, 42 George Street, Edinburgh.

Special terms for selected places, or a series of (changeable) advertisements.

The Editor begs to acknowledge the receipt of the following books :—

A Class Book of Botany. By Mudge & Maslen. London : Arnold. Price 7s. 6d.

Country Rambles. By Percival Westell, M.B.O.U. London : H. J. Drane. Price 10s. 6d.

The Cloud World. By Samuel Barber. London : Elliot Stock. Price 7s. 6d.

Ways of the Six-Footed. By Anna Comstock. London : Ginn & Co. Price 2s.

Insect Folk. By Margaret W. Morley. London : Ginn & Co. Price 2s.

The Birds of Bempton Cliffs. By E. W. Wade. Hull : A. Brown & Sons. 2s.

The Œstrous Cycle in the Sheep. By F. H. A. Marshall, B.A. London : The Royal Society, Dulau & Co. 4s.

Sea and Coast Fishing. By F. G. Aflalo. London : Grant Richards. 6s.

The Editor begs to acknowledge the receipt of the following :—

Knowledge—June, July, August.
The Animals' Friend (three numbers).
Yorkshire Weekly Post (three numbers).
The Naturalist—May, June, July.
Nature Study—May, June, July.
The Humane Review—July.
Proceedings of Chester Society of Natural Science. (Lepidoptera. Price 2s. 6d.
Annual Report, North Staffordshire Field Club.
Annual Report, Manchester Field Naturalist and Archæological Soc.
Transactions of the Woolhope Naturalists' Field Club.
Proceedings of Royal Physical Society, Edinburgh, 1901–1902.
Record of Bare Facts. Caradoc and Severn Valley Field Club.
The Humanitarian.

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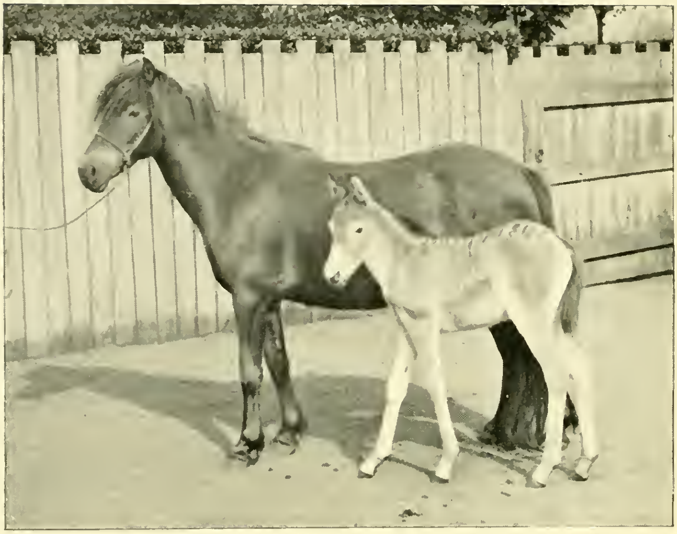
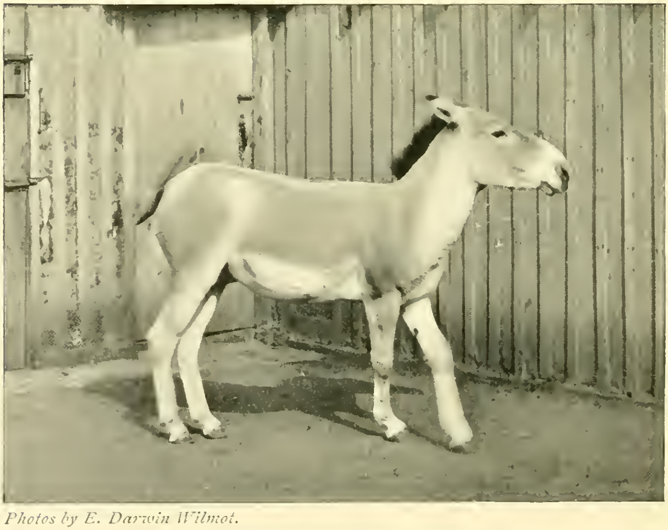


EXMOOR PONY AND HER HYBRID FOAL.



Photos by E. Darwin Wilmot.

ASIATIC WILD ASS.

The Field Naturalist's Quarterly

VOL. II. NOVEMBER 1903 NO. 8.

Editorials.

THE Annual Meeting of the British Association was held this year in Southport, and was well attended, there being some 1800 members, associates, etc., present. The meeting opened on 10th September, when the President, Sir Norman Lockyer, delivered his presidential address to a crowded audience. After a reference to the loss sustained by the Association and British science generally in the death of the late Lord Salisbury, and the announcement that the President for next year was to be Mr. A. J. Balfour, Sir Norman Lockyer proceeded to deal with the Influence of Brain-Power on History. His first point was that statesmen and politicians will in the future be compelled to pay more regard to education and science as empire-builders and empire-guarders than they have paid in the past. That the British Association has a distinct call to assist in this direction was brought out by quoting the objects of the Association as laid down by its founders seventy-two years ago. These objects are—"To give a stronger impulse and a more systematic direction to scientific inquiry—to promote the intercourse of those who cultivate science in different parts of the British Empire with one another and with foreign philosophers—to obtain a more general attention to the objects of science, and a removal of any disadvantages of a public kind which impede its progress."

It was to the last of these objects that Sir Norman Lockyer devoted his attention, somewhat to the disappointment of many who had hoped to hear him on his own special subject. But we cannot help thinking that he was right in saying that unless by some means or other we do obtain a more general attention to the objects of science, and a removal of any disadvantages of a public kind which impede its progress, we shall suffer in competition with other communities in which science is more generally utilised for the purposes of national life. Most observers are of opinion that we have already suffered in this respect. The struggle for existence in modern communities is a struggle between organised species—nations,—a struggle in which science and brains are taking the place of swords and sinews, and the new battlefields of this warfare are the school, the universities, the laboratory, and the workshop. The great need is for a body dealing with the organisation of science in this country, a body analogous to the Chamber of Commerce in the commercial world, a body which will formulate the demands of science in the nation's welfare, and submit those demands to the proper quarters for carrying them out. This function, the President contended, was to be found already in existence in the British Association, if it carried out its duty as mentioned in the last of the above-quoted objects of its existence. It is evident that this function was strongly in the minds of its founders, and the organisation is framed admirably for influencing public opinion, and so for bringing pressure upon governments. The following facts show this:—(1) The Association is not limited to any branch or branches of science; (2) it has a wide and numerous fellowship, which renders possible strong committees on any subject; (3) the annual meeting is held at a time when people can pay attention to the deliberations, and when the press can print reports; (4) recruits and committees can be obtained and established in various localities, even beyond the seas, since the place of meeting changes from year to year, and is not limited to these islands. The President continued—

"We not only, then, have a scientific Parliament competent to deal with all matters, including those of national importance, relating to science, but machinery for influencing all new councils and committees dealing with local matters, the functions of which are daily becoming more important.

"The machinery might consist of our corresponding societies. We already have affiliated to us seventy societies with a membership of 25,000. Were this number increased so as to include every scientific society in the Empire, metropolitan and provincial, we might eventually hope for a membership of half a million."

So far, so good. We fully admit the need for some such body, and the possibility of its inception by the British Association. But we should like to draw attention to the words, "We have already affiliated to us seventy societies." We should like to know if the Council of the British Association is aware that there are in the British Islands something like 500 scientific societies, including the field clubs, which are engaged in studying the local aspects of science. If they are aware of this, we should further like to ask if any *systematic* effort is being made, or has been made, to secure the assistance of these bodies, and to enrol their members on the list of the British Association. And lastly, we should very much like to know how it is, if any attempt has been made to affiliate all these societies and to enrol their members, why such a small measure of success has been attained. There is a very serious fault somewhere. The British Association will do well to earnestly consider why it is that such a very large proportion of the local scientific societies in this country take no interest in its proceedings, and why the majority of the members of these societies are not to be found on the list of the members or associates of the Association.

We are in a position to state that it is not from a feeling of apathy that the local societies stand aloof to such a large extent as they do. We are fully aware that a certain number of them send delegates to the Association, or rather elect delegates, some of whom attend, and some of whom do not. But we contend that the mere attendance of one individual as a delegate from a society which has 250 members is entirely beside the point. What is wanted is that all those members who can find time should feel it a duty and a privilege to be at the annual meeting. In that way only can the influence of the Association be made effective throughout the country. At present a very large number of societies, with a considerable proportion of enthusiastic members, are either ignored by the Association or ignore the Association, or both. Again we ask, Why?

The answer to this question will occur at once to every member of a field club or kindred society who reads these lines. We doubt whether it is so apparent to the British Association officials, or surely they would have taken steps to remedy it before now. In conversation with the few members of these societies who were present at the recent meeting, we found absolute unanimity on the point, and if the Association will take the trouble to inquire, they will readily find the explanation. If no one else does so, and if the Association is in earnest in wishing to obtain the assistance and support of these numerous societies, we will ourselves express what we know to be the opinion of these bodies.

* * * * *

Sir Norman Lockyer, having suggested the need of organisation, proceeded to point out the work which, in his opinion, such an organisation should take up. Briefly, the two most important questions which he thought called for immediate effort were "the lack of completely efficient universities, and our neglect of research." After an elaborate comparison between ourselves and America and Germany in these matters, he came to the conclusion that we required at least eight new universities in Great Britain, which should be provided by the State at a cost of £24,000,000. With regard to this proposal we have only to say that what is first required is the setting in order of our system of earlier education, so as to produce a larger number of capable students. To begin with more universities is to attempt to put the roof on before the foundations are well laid. Produce first eight times as many students as are produced at present, who demand the advantages of the best universities, and the universities will soon be found to follow. At the present moment we fear that it is the fact that most students who proceed to a university are but badly equipped to receive the teaching they there get. Begin at the beginning, increase the demand for the best scientific training, and the means will soon be forthcoming.

* * * * *

With regard to the lack of means for the promotion of research, everyone will agree with Sir Norman Lockyer's remarks. As he pointed out, this need is recognised by others than scientists. It has been insisted upon by the most eminent statesmen of the country, but apparently they are not prepared to go the length of seeing it made a matter of immediate attention at the hands of Parliament. And so, as Mr. Balfour has said, "We, the richest country in the world, lag behind Germany, France, Switzerland, and Italy. Is it not disgraceful? Are we too poor, or are we too stupid?"[1]

* * * * *

Coming to the various sections of the Association, we have only space to refer to the most interesting presidential address of Professor Sydney Hickson to the Zoology Section (D), which dealt with many matters which are much before biologists at present. Here, again, the neglect of provision for more research was deplored, the President pointing out that "neither in the older universities of Oxford and Cambridge, nor in the colleges and national institutions situated in London, nor in the newer universities and colleges of the provinces, have any new posts been created, or adequately endowed, which enable the holder to devote a reasonable amount of his time to the pursuit of biological knowledge."

On another point we find ourselves in most hearty agreement with Professor Hickson. It is in the following sentences :—" We have all realised that in this country, more than in any other that is called civilised, there prevails among all classes an extraordinary ignorance of the first principles of biological science. . . . We must remember that the science of Natural History is as a closed book to most of those who, after a public school and university education, have attained to a position of trust and responsibility in the government of our country and our cities. . . . It is of fundamental importance for the zoologists of this country to consider and report upon the necessity for the extension and improvement of the teaching of Natural History in our schools and colleges."

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[1] *Nature*, 30th May 1901.

Our readers know that for the past year we have been urging precisely this duty upon our secretaries of field clubs, namely, the teaching of the *first principles* of biological science, and it is with great pleasure that we find the President of the Zoology Section at the British Association also insisting upon its importance. We trust that the section will make it their business to have a full discussion of this matter on the first opportunity. If more attention were given to questions of this sort, there would be much additional interest taken in the proceedings by the members of the various scientific societies. Closely bound up with this is the need emphasised by Professor Hickson for the provision of the necessary machinery for the full discussion of the matters which affect the welfare of the science as a whole. As he said, there is no society which all serious students and teachers of zoology feel is the one society which it is their duty and in their own interests to join. It is easy to see, and we quite agree with him, that his own opinion is that Section D of the Association ought to be that society. Why is it not so at present?

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In some remarks which followed Professor Hickson's paper, the Rev. T. Stebbings (whose articles in *Knowledge* we have frequently referred to) drew attention to a matter which was commented on in these columns in our last issue. He emphasised the need of some ready means of reference to all the papers and articles upon scientific subjects which appear in the large number of periodicals which now deal with science. As he said, it is impossible to read them all, or to subscribe to all, and the naturalist doubtless misses a good deal of what would interest him, by not being aware of its publication. We attempt to help our own readers in this matter as far as we are able, by drawing attention to the contents of our contemporaries, in so far as they deal with subjects of interest to field workers, but we do not receive all the journals, nor does space permit of anything like a complete review of the current literature. As we said in last issue, we have our own ideas as to how this might be done, but the move must come from the members of field clubs and others who are sufficiently anxious to see the reform. It is another matter which the British Association might well consider, and suggest some scheme for approval and discussion.

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On the whole, there were but few papers read which the members of the Southport Natural Science Society could be expected to be keenly interested in; but there were two notable exceptions, both of which were in the Geology Section. The first of these was by Mr. J. Lomas on "The Geology of the Country around Southport," and the second was that by Mr. Harold Brodrick on "The Geology of Martin Mere." This latter was an extremely interesting account of Mr. Brodrick's original work on Martin Mere, which he has made his own special study, and it was listened to with evident appreciation. Another communication of local interest was that by Dr. Otto Darbishire on "The Sandhill and Saltmarsh Vegetation of Southport," in the Botany Section, and the author also conducted an excursion on the sandhills.

On the whole, perhaps the most attractive sectional meetings were those in the Anthropology Section, presided over by Professor Symington, where many papers drew large audiences. The discussions in the Educational Science Section were also largely attended; and it is gratifying to see so much attention being paid to the scientific education of the country.

That hardy literary autumnal annual, "The Adder-Swallowing Question," has been with us as of yore, and Mr. Tegetmeier has had the usual adders sent to him for dissection, all of which had been supposed by the senders to have swallowed their young, and all of which on dissection were shown to have swallowed *something else.* In one case it was a common viviparous lizard which the adder had made a meal of, in another a slow-worm had been likewise disposed of; but in no case were young adders to be found in the gullet. In the first case the lizard was stated to be the sand lizard, but from the locality of the specimen this was an obvious error, and it was corrected in the following issue of *The Field.* The sand lizard still remains something of a puzzle as to its distribution, being restricted to a few localities south of the Thames, and to the coast in the neighbourhood of Southport.

These cases indicate another source of the innumerable instances which have been stated to occur of the adder-swallowing. It seems that it is quite sufficient for some people to see an adder swallow something for them to feel sure that the something must have been young adders, though it is not easy to understand why that conclusion should be jumped at. However, the £5 reward for an adder containing young ones in the gullet is still to be earned, though it is probably too late for any further claims to be forthcoming this year, as the adders—and the young—have retired from a troublous world for a quiet few months of hibernation. Doubtless, next autumn will see them in evidence again. Meantime, it is once more proved that a very large number of people cannot be relied upon to give an accurate description of a simple event which takes place before their eyes.

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The editor begs to thank the numerous correspondents who, in response to his request for information on local lizard distribution, have sent him their notes. These have been incorporated in *British Lizards*, as far as they were received in time. The information thus obtained shows a very general interest in this group of our fauna, and we shall be glad to publish further notes on our lizards in these columns, particularly observations on the habits and distribution, concerning both of which matters we have still a great deal to learn.

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It is with very great regret that we record the death of Mr. J. J. Fitzpatrick, President of the Liverpool Naturalists' Field Club. Mr. Fitzpatrick will be much missed by many of the local scientific societies. His knowledge of geology and archæology, and his particularly genial temperament, made him a most welcome and valuable member of the Geological Society, the Science Students' Association, and the club of which he was president. His presidential address, which he was to have given at the November meeting, will be read on the same date as was originally fixed.

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With this issue the *F. N. Q.* reaches the end of its second year of publication, completing Volume II. We therefore include in this number the full list of contents of the volume, together with an index of the year's subject-matter, so that those who wish to have the four numbers bound may do so with the least possible trouble. The publisher has made arrangements for binding Volume II. in an attractive manner, the cost and other details of which are stated under the Notices at the end of this issue. Subscribers who desire to avail themselves of this are requested to send the four issues as soon as possible to the publisher.

The Wild Horse (*Equus prjevalskii*, Poliakoff).

By J. Cossar Ewart, M.D., F.R.S., *Professor of Natural History, University of Edinburgh.*

(Extracts from a paper read before the Royal Society of Edinburgh, 15th June 1903.)

In the time of Pallas and Pennant, as in the days of Oppian and Pliny, it was commonly believed true wild horses were to be met with not only in Central Asia, but also in Europe and Africa. But ere the middle of the nineteenth century was reached, naturalists were beginning to question the existence of genuine wild horses; and somewhat later, the conclusion was arrived at that the horse had long "ceased to exist in a state of nature."[1]

This view had barely been accepted by zoologists, when it was announced from St. Petersburg that a true wild horse had at last been discovered in Central Asia by the celebrated Russian traveller, Prjevalsky.

An account of this horse was communicated by Poliakoff in 1881 to the Imperial Russian Geographical Society.[2] The material at Poliakoff's disposal being limited, zoologists were not at once disposed to admit that Prjevalsky's horse, as it came to be called, deserved to rank as a distinct species. Some believed the new horse had no more claim for a place amongst wild forms than the mustangs of the Western prairies or the brumbies of the Australian bush; while others asserted it was merely a hybrid between the Kiang (*Equus hemionus*) and a Mongolian or other Eastern pony.

As far as I can gather, it is generally believed in England that Prjevalsky's horse is a hybrid — a cross between a pony and a Kiang. Beddard, however, admits it may be a distinct type. He says: "This animal has been believed to be a mule between the wild ass and a feral horse; but if a distinct form—and probability seems to urge that view—it is interesting as breaking down the distinctions between horses and asses."[3]

It must be admitted that in its mane and tail Prjevalsky's horse is strongly suggestive of a hybrid, but in the short mane and mule-like tail we may very well have a persistence of ancestral characters—in the wild asses and zebras the mane is always short, and they never have long persistent hairs at the proximal end of the tail.

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[1] Bell's *British Quadrupeds*.

[2] A translation of Poliakoff's paper will be found in the *Annals and Magazine of Natural History*, 1881. See also Tegetmeier and Sutherland's *Horses, Asses, and Zebras*.

[3] Beddard, *Mammalia*, p. 240. Macmillan, 1902.

Though a superficial examination may lead one to think with Flower that Prjevalsky's horse is an accidental hybrid, a careful study of the soft parts and skeleton inevitably leads to quite a different conclusion.

Though failing to understand why so many zoologists persisted in considering the horse of the Great Gobi Desert to be a mule, I decided to breed a number of Kiang-horse hybrids.

With the help of Lord Arthur Cecil, I succeeded in 1902 in securing a male wild Asiatic ass and a couple of Mongolian pony mares, one a yellow-dun, the other a chestnut. "Jacob," the wild ass, was mated with the dun Mongol mare, with a brownish-yellow Exmoor pony, and with a bay Shetland-Welsh pony. The chestnut Mongol pony was put to a light grey Connemara stallion.

All four mares proved fertile, with the result that three hybrids and a pony foal were obtained. The Exmoor pony and her hybrid foal, aged nine days, are the subject of Mr. Wilmot's photograph.

It may be mentioned that the Exmoor pony had in 1900, and again in 1901, a zebra hybrid, the sire being the Burchell zebra, "Matopo," used in my telegony experiments.

In the case of her Kiang hybrid the period of gestation was 335 days (one day short of what is regarded as the normal time), but she carried her 1900 zebra hybrid 357 days, three weeks beyond the normal time. The Exmoor-zebra hybrids are as nearly as possible intermediate between a zebra and a pony; the Kiang hybrid, on the other hand, might almost pass for a pure-bred wild ass.[1] In zebra hybrids the ground colour has invariably been darker than in the zebra parent; but the Kiang hybrid is decidedly lighter in colour than her wild sire, while in make she strongly suggests an Onager—the wild ass so often associated with the Runn of Cutch. Alike in make and colour the Kiang hybrid differs from a young Prjevalsky foal.[2]

I have never seen a new-born wild horse; but if one may judge from the conformation of the hocks, from the coarse legs, big joints, and large head of the yearlings,—from their close resemblance to dwarf cart-horse foals,—it may be assumed they are neither characterised by unusual agility nor fleetness. The Kiang hybrid, on the other hand, looks as if built for speed, and almost from the moment of its birth, it has by its energy and vivacity been a source of considerable anxiety to its by no means placid Exmoor dam. When four days old it walked over twenty miles; on the fifth day, instead of resting, it was unusually active, as if anxious to make up for the forced idleness of the previous evening. In the hybrid the joints are small, and the legs are long and slender and covered with short close-lying hair. In the wild horse the joints are large, and the "bone" is round as in heavy horses.

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[1] In Mendelian terms, the Exmoor pony proved *recessive*, the wild ass *dominant*.

[2] For a skin of a very young Prjevalsky foal I am indebted to Mr. Carl Hagenbeck of Hamburg.

As to its colour, it may be especially mentioned that the hybrid has more white around the eyes than the wild horse, but it is of a darker tint along the back and sides and over the hindquarters. Too much importance, however, should not be attached to differences in colour; for though the hybrid foals which have already been bred closely agree in their coloration, subsequent foals may differ considerably, and it is well known that young wild horses from the western portions of the Great Altai Mountains differ in tint from those found farther east.

Of more importance than the coat-colour is the nature of the hair. A Prjevalsky foal has a woolly coat not unlike that of an Iceland foal. In the hybrid the hair is short and fine, and only slightly wavy over the hind-quarters. It thus differs but little from a thoroughbred or Arab foal.

The mane and tail of the hybrid are exactly what one would expect in a mule; the dorsal band, 75 mm. wide over the croup in the sire, has in the hybrid a nearly uniform width of 12 mm. from its origin at the withers until it loses itself half-way down the tail. The tail, which differs but little from that of a pony foal, is of a lighter brown colour than the short upright mane, while the dorsal band is of a reddish-brown hue. In the wild horse the dorsal band is sometimes very narrow (under 5 mm.) and indistinct. In the Kiang sire there are pale but quite distinct stripes above and below the hocks, and small faint spots over the hind-quarters—vestiges apparently of ancestral markings; but in the hybrid there are neither indications of stripes across the hocks or withers nor spots on the quarters.[1]

In having no indications of bars on the legs or faint stripes across the shoulders, the hybrid differs from Prjevalsky colts; it also differs in having a longer flank feather, and in the facial whorl being well below the level of the eyes. As in the Kiang and some of the wild horses, the under surface of the body and the inner aspect of the limbs are nearly white.

In the hybrid the front chestnuts (wrist callosities) are smooth and just above the level of the skin; but instead of being roughly pear-shaped as in the Kiang, they are somewhat shield-shaped as in the Onager. In the wild horse the front chestnuts are elongated.

In the Exmoor dam the hind chestnuts (hock callosities) are 27 mm. in length and 10 mm. wide. In the sire there is a minute callosity inside the right hock. In the hybrid the hind chestnuts are completely absent. In the absence of hock callosities the hybrid differs from the wild horse, in which they are relatively longer than in Clydesdales, Shires, and other heavy breeds of horses. In the hybrid, as in the sire and dam, there are smooth, rounded fetlock callosities (ergots) on both fore- and hind-limbs.

In the wild horse the hoof is highly specialised, the "heels" being bent inwards (contracted) to take a vice-like grip of the frog. In the hybrid the hoof closely resembles that of the pony dam; it is shorter than in the Kiang, and less contracted at the "heels" than in the wild horse.

The Kiang hybrid further differs from a young wild horse in the lips and muzzle, the nostrils and ears, and in the form of the head and hind-quarters.

The wild horse has a coarse, heavy head, with the lower lip (as is often the case in large-headed horses and in Arabs with large hock callosities) projecting beyond the upper.

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[1] The complete absence of stripes in the Kiang hybrid is all the more interesting, seeing that the dam's previous foals were zebra hybrids. Evidently the Kiang hybrid lends no support to the telegony doctrine.

The nostrils in their outline resemble those of the domestic horse, while the long-pointed ears generally project obliquely outwards, as in many heavy horses and in the Melbourne strain of thoroughbreds. Further, in the wild horse the forehead is convex from above downwards as well as from side to side; hence Prjevalsky's horse is sometimes said to be ram-headed. In the hybrid the muzzle is fine as in Arabs, the lower lip is decidedly shorter than the prominent upper lip, the nostrils are narrow as in the Kiang; and even at birth the forehead was less rounded than is commonly the case in ordinary foals. The ears of the hybrid, though relatively shorter and narrower than in the Kiang, have, as in the Kiang, incurved dark-tinted tips, and they are usually carried erect or slightly inclined towards the middle line. In the wild horse the croup is nearly straight, and the tail is set on high up as in many desert Arabs. In the hybrid the croup slopes as in the Kiang and in many ponies, with the result that the root of the tail is on a decidedly lower level than the highest part of the hind-quarters. Further, in the young wild horses I have seen the heels (points of the hocks) almost touch each other, as in many Clydesdales, and the hocks are distinctly bent. In the hybrid the hocks are as straight as in well-bred foals, and the heels are kept well apart in walking.

Another difference of considerable importance is, that while the wild horse neighs, the hybrid makes a peculiar barking sound remotely suggestive of the rasping call of the Kiang.

If Prjevalsky's horse is neither a Kiang-pony mule nor a feral Mongolian pony, and if, moreover, it is fertile (and its fertility can hardly be questioned), I fail to see how we can escape from the conclusion that it is as deserving as, say, the Kiang to be regarded as a distinct species. Granting Prjevalsky's horse is a true wild horse, the question arises: In what way, if any, is it related to our domestic horses? It is still too soon to answer this question; but I venture to think that should we by and by arrive at the conclusion that our domestic horses have had a multiple origin,—have sprung from at least two perfectly distinct sources,—we shall probably subsequently come to the further conclusion that our big-headed, big-jointed horses, with well-marked chestnuts on the hind-legs, are more intimately related to the wild horse than the small-headed, slender-limbed varieties without chestnuts on the hind-legs; that, in fact, the heavy horses found living in a semi-wild state and Prjevalsky's horse have sprung from the same ancestors.

Our Coast Museums and their Zoological Treasures.

By F. G. Aflalo, F.R.G.S., F.Z.S.

I. The East Coast.

ALTHOUGH our English centres of thought and learning do not, like those of Australasia, congregate immediately on the seashore, it is obvious to anyone visiting the museums at our larger ports and watering-places that the educational developments of recent years have reached even to the coast. Sometimes, as at Whitby, the museum is maintained by voluntary contributions and a small fee for admission, the said funds being administered by a local committee. Elsewhere, as at Scarborough, the museum has the advantage of ownership by an enthusiastic field club or philosophical society, with regular donations and subscriptions. The third case, illustrated by the museums at Hull and Great Yarmouth, is that of Corporation management, in which case the institution is financed in the ordinary way out of the rates. Needless to say, such a condition is the most prosperous of all, for the fortunes of scientific collections which depend for their maintenance and increase on the public affection are notably precarious.

It was my fortune during the summer of 1903 to visit every museum of note round the English coast, from Yorkshire round to Lancashire; and it occurred to me that one or two notes on the chief animal treasures, with a selection of photographs for which I am in every case indebted to the kindness of the officials, might be of some value as affording a basis of comparison, as well as some guide to many who might be glad to know the whereabouts of specimens particularly interesting to them.

Their geographical position, on the edge of the sea, obviously fits these museums to excel in two distinct categories of objects—marine fauna and curios from overseas, of which, as they lie handy to the newly landed seaman in search of money to spend ashore, they often get the first refusal. As a matter of fact, the necessary delays of purchase, incidental to the prescribed reference to the committee, are in many cases irksome to the thirsty vendor, who cares little what he gets so he gets it on the nail, and the curios therefore pass into the possession of retail dealers or pawnbrokers. Such articles as savage weapons and clothing are, moreover, easier to bring home than zoological specimens, and are therefore more commonly chosen as gifts by local travellers interested in the fortunes of the collection. With the ethnological curios, which are so important an element in provincial museums, this article does not concern itself, since they are in great measure inappropriate to the pages of the *Field Naturalist's Quarterly*. With one or two exceptions, indeed, the animal treasures referred to in these articles will be found to possess a strong local interest; and the curators and committees of our coast museums would, as a matter of fact, do well if they expended their money and their care on the fauna and antiquities of their own locality, leaving exotic material as the more fitting concern of the National Collection in London.

An exception of the kind is found in the famous giant tortoise of the Scarborough Museum. Pleasantly situated beneath the façade of the Grand Hotel, in a picturesque valley spanned by a bridge that leads past a noisy rookery, this museum has nothing that it values more highly than this huge chelonian. It was presented by Mr. John Wharton, as long ago as 1839, and its value is not so much in its size as in the abnormal shape of the carapace. Indeed, it is an open secret, and the subject of an entry in the *Proceedings* of the Society which owns it, that Mr. Walter Rothschild has in vain offered in exchange one of almost twice the size. The committee, however, thinks that anything coveted by that eminent naturalist for Tring must be worth keeping, and it has decided to keep its tortoise.

Scarborough was not the point from which my tour of the coast started, and I had first to visit Whitby and to see the fossil saurian, or "allegator" (*Teleosaurus*), as it was described at the time of its discovery in the Upper Lias of the neighbouring cliffs some hundred and fifty years ago. It must have been a fearsome playmate on the foreshore in its day, and aboriginal bathers, desiring to wash off the old coat of woad, must have gazed anxiously up and down that serried coastline for signs of the enemy. The authorities have placed the skull of a Ganges gavial handy for purposes of comparison. Whitby, which has always been as famous for fossils as for its now neglected jet, has other valuable extinct saurians in the museum, while another specimen sure to attract attention is a well-stuffed ribbon-fish, probably 8 or 10 feet long (I took no actual measurement), which was washed up on the beach a little to the northward.

At Hull one finds the first really important museum. Lately taken over by the corporation from a local scientific society, and placed under a very able energetic curator in Mr. Thomas Sheppard, F.L.S., the Hull Museum, though many leading residents have never troubled to visit its halls, is a credit even to so important a city. If one were asked to pick out the characteristic animal groups in so varied and representative a collection, I think the whales, seals, and polar bears would take precedence. The explanation is easily found, for Hull played a great part in the brave old whaling days, and many a treasure from the icy north thus found a permanent resting-place in the society's museum. This accounts for the valuable collection of lances and harpoons, and Hull can afford to call them relics of her vanished whale fisheries without a pang, since other equally profitable fisheries now engage all her capital and labour. In whales the museum has a nice choice, one of them being a fœtus of 2 or 3 inches long, which now hangs in a bottle of preservative. Yet the most valuable of all the museum's whales cannot in any sense be regarded as a relic of the whaling days, since it was, in

1835, washed up in the Humber estuary. It is larger than the whale in the bottle; in fact, it measures (in the skeleton) only 30 inches short of 50 feet, while its upper jaws display no fewer than five hundred and eighty plates of short, black whalebone. This is an example of that largest mammal known to science, Sibbald's Rorqual. Far larger examples have been stranded on our shores, but the Hull specimen bases its prior claim on something other than mere bulk. It is, in fact, a type whale, the example from which Gray first described the species. I do not know whether the British Museum has a type whale at Cromwell Road, but I am by no means sure that it has. The treasures of the Hull Museum run in the direction of extremes of size, for the curator also has some type diatoms, appreciable only through the microscope. Possibly these tiny gentry once revelled and made merry in the globigerine ooze of the Humber. The famous Dobree collection of Noctuæ and the fossil finger-bone of a British lion—that the lion, or, at anyrate, a lion-like animal, once roamed in Britain's forests is well assured—are among the other possessions of interest to the naturalist.

Necessarily omitting the splendid collections of both Ipswich and Norwich, I come next to the excellent municipal museum at Great Yarmouth. While the most lasting memory of the visitor will, perhaps, include the underground dungeons, the old coaches, and the models of local fishing craft of many ages, I was particularly struck by the contents of two cases, of which the curator has kindly sent me photographs, specially taken (like all the rest) for this article, displaying local birds and fishes. The first shows some typical Broadland birds, such as ruffs, grebes, and spoonbills. I regret the hoopoe, but, if it had to be shot—and such seems the fate of stragglers to these hospitable shores—it is, at anyrate, better that it should rest in a public museum rather than in the smoking-room of its last enemy on earth. The fishes are also interesting, if only by a singular sin of omission. Yarmouth's staple fish,—its trawling glory has passed to Lowestoft,—the herring, finds no place in this case!

(*To be continued*)

Reptile Studies.

By Gerald Leighton, M.D., F.R.S.E.

X. The Process of Digestion in Serpents.

Certain appearances that I have from time to time observed in snakes which I have dissected, lead me to think that the process of digestion in these reptiles is inadequately understood and described. I refer here to the mechanical part of the process, not the physiological action of the digestive fluids. I am satisfied that in the mechanism of digestion we have to deal with a process undescribed in text-books, and which is briefly now dealt with.

Serpents are, of course, animals which swallow very large articles of diet, and swallow them whole, there being nothing in the shape of mastication in ophidian digestion. Such diets often consist of frogs, newts, fish, water-voles, mice, rats, birds, lizards, and even other snakes. All of these are swallowed entire, the enormous capacity of the ophidian jaw for dilatation allowing of the passage of this food into the gullet. In order to understand what takes place after this, it must be stated that the alimentary canal in serpents is divided into three portions, best termed the fore-gut, the mid-gut, and the hind-gut. These three parts are often spoken of in books as the gullet, stomach, and intestine respectively. The gullet is long, widely distensible, with very thin elastic walls, and is non-digestive in function. In the case of the adder it is 9 inches long in an average-sized specimen. It ends abruptly at a constriction, and at this point the walls become thick and strong, and not so distensible. Here commences the mid-gut, an organ which is surprisingly small. In adders it measures 2½ to 3 inches in length. In an Australian black snake 4 feet long this mid-gut was 5 inches in length. If opened, its walls are seen to be thrown into longitudinal folds or rugæ, thick and vascular. At the posterior end is a second constriction. The question is doubtful whether the constriction at the anterior end corresponds with the cardiac end of the mammalian stomach, and that at the posterior end with the pyloric constriction, or not. It does not, however, concern my present point. The hind-gut, of course, runs from the posterior end of the mid-gut to the anal orifice, the terminal portion being a short straight rectum.

The parts played by these three portions of the tract in the mechanism of digestion are as follows:—

(*a*) The gullet holds the food swallowed until such time as the reptile begins to digest. No change takes place in the food as long as it remains in this fore-gut.

(*b*) The mid-gut digests the food *as it passes into it from the fore-gut.*

(*c*) The hind-gut absorbs the digested food, acts on such as has not already been digested, and absorbs that, and passes on the small amount of fæcal matter which escapes from a snake.

At first sight it might appear that there is nothing unusual in this, but that is not so. The curious part of the process is that stated in the words underlined, namely, that the food is digested in the mid-gut *as it passes into that organ from the gullet.* In other words, the food does not pass from the gullet into the stomach or mid-gut and then undergo digestion, which is the usual method, but is held by the constricting muscles at the entrance, passes in gradually, becoming disintegrated as it does so. The evidence that I bring forward in support of this statement is as follows:—

It is, of course, well known that animals swallowed alive by snakes may and do survive their incarceration in the gullet, provided that that incarceration is not of too long duration. A frog has been known to remain for twenty minutes in the gullet of *T. natrix*, and on being disgorged exhibit no ill effects. I have repeatedly caused snakes to disgorge frogs which they have swallowed, and seen the same thing. This is very easily done by stroking the belly of the snake after the frog has passed into the gullet. Indeed, merely picking up the reptile is often sufficient to bring about the ejection of recently swallowed food. Then the dissection of a large number of adders and ring-snakes has shown me many instances in which the food had been in the gullet long enough to die; but in no case is it ever changed so long as it remains there. As I have said, there is nothing remarkable in this fact. But on one occasion I caught an adder which was very heavy in the region of the throat, evidently full of food, and on expressing the contents out of the mouth I found that the first object to appear was a water-vole, with no signs at all of digestion upon it. This was followed by a second, which was quite perfect until the head appeared (the vole as usual having been swallowed head first). The head, however, was partially digested. I argued that if the vole had been passed on entire into the digesting part of the alimentary tract, it would show evidence of the process over the whole body, not merely at one point. The question that remained then was to get a specimen in which I could observe the position of food in the act of digestion, so as to ascertain the exact mechanism. It was a long time before I got such a specimen ; indeed, it was only when working at this subject quite recently. Last year (1902) my collectors sent me two specimens which clearly demonstrated the whole process. The first of these was a specimen of *Vipera aspis*, sent to me from near Bordeaux in France. I felt by external examination that it had food in it, so opened the alimentary tract *in situ*. The result was most interesting. A full-sized green lizard, *Lacerta viridis*, was lying half in the gullet and half in the mid-gut, the former half unchanged, the latter part absolutely disintegrated by digestion except the bony parts. It was firmly gripped by the constriction at the entrance to the mid-gut, marking off at a definite point the digested from the undigested part. The lizard had been swallowed head first, and digestion had got to the length of destroying the head, thorax, and part of the abdomen of the lizard, leaving the tail and hind limbs untouched. The stomach wall of the lizard was dissolved, revealing in turn the food of the lizard, in the shape of a large number of beetles.

The second specimen, which I happened to receive shortly afterwards, was an Australian black snake over 3 feet long. On opening this in the same way I was very gratified to find an analogous state of things. The snake had swallowed head first a large frog of some species. As before, the anterior half of the amphibian was disintegrated by digestion, the head, both fore-limbs, and one hind-limb which had been pushed forwards in the act of swallowing, being quite untouched. As before, the food was fixed at the constricting entrance.

These two specimens settled the point; and it then occurred to me that if one had thought at first of estimating the capacity of the stomach, and comparing it with the bulk of some of the animals which form the food of snakes, one could have foretold the result theoretically. I have mentioned that this mid-gut is very small, in the adder only a little more than 3 inches long. But the adder feeds on slow-worms, it may be, 12 inches in length, mice, voles, birds, etc., none of which could be contained whole in the stomach. It is therefore obvious that some arrangement is necessary to allow of the food being passed into the mid-gut gradually, and being digested as it does so. That this actually is what happens these examples show.

This process, in all probability, explains in part why serpents feed at such long intervals. I am not able to state how long it takes for an adder to digest a slow-worm a foot long, but it must be some considerable time; and while the process is in course of completion, it is not likely that the snake will take in further food.

One other point is suggested. It seems evident that the serpent can retain food in the gullet for some time undigested. That is shown by the first case quoted, in which the vole swallowed last was untouched. It would be interesting to find out whether the snake can pass on the food at will, or whether the process is involuntary. It can certainly eject swallowed food at will, so that possibly it can also control the rate at which it digests.

Since these specimens were of widely different species, it is a fair assumption that this mechanism of digestion is common to the Order Ophidia, and as far as I know is found in them alone.

The two specimens and their food, in course of digestion, are now in the Zoological Museum at Edinburgh University.

XI. THE LIMBS OF LIZARDS.[1]

The widespread idea that the slow-worm is a snake and not a lizard is no doubt due to the fact that it possesses no visible signs of the presence of limbs. And as this absence of limbs is a characteristic feature of the serpents, the term "serpentiform" is used to describe those lizards which are likewise devoid of limbs, or partially so.

The oldest reptiles were possessed of the ordinary number of four limbs, constructed on the usual vertebrate pentadactyle type; it is only among recent forms that we meet with this singular departure from the vertebrate type of limbs, of which we have such a striking example in our indigenous slow-worm. In other words, limbless lizards have been evolved from lizards with four limbs, by a gradual process of reduction in size and number of limbs, and this reduction having been specially suited to some of the conditions in which reptiles are found, has become a fixed character in certain families and species. The process is an excellent example of the origin of specific characters which the field naturalist may well be expected to be interested in, and we therefore propose to indicate very simply and briefly the views that are held on the subject, taking the slow-worm as an illustration.

The problem may be thus stated. Seeing that the earlier forms of reptiles were provided with limbs, and that at the present time a large number are limbless, what explanations does biology offer to account for this structural change occurring in the first instance, and becoming a fixed character afterwards in some species? Every field worker should be familiar with modern teaching on this question, and the group of lizards is a very convenient one in which to indicate the views held by various schools of thought.

For our purpose all that is necessary is to indicate the two main lines on which the explanations of such problems run, the older or Lamarckian view, and what we may describe as the modern or Darwinian view.

The underlying universal fact which has driven so many observers to give their attention to these matters is the great variation that is found everywhere in the animal world. The systematist gives expression to these variations by dividing animals into orders, families, genera, and species, according to their affinities and differences, thus emphasising the fact that some animals are closely related to others. But, further than that, it is a matter of common knowledge that no two animals are exactly alike, even the members of the same litter, except under very exceptional circumstances which we need not consider. Out of a litter of half a dozen puppies, some may resemble one parent, some another, some neither; while as they grow up to adult life entirely new characters may make their appearance in one of them. In other words, there is great variation even in closely related organisms. It is the question of what causes this variation in animals that gave rise to the two views above mentioned. How came the wonderful variety in shape, size, structure, and habits of all the species of animals? A paragraph in Mr. G. P. Mudge's *Text-Book of Zoology* puts the matter as follows:—

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[1] This article forms chapter xiii. of Dr. Leighton's new book, *British Lizards*.

"Biologists are divided into two great camps on the question of the 'Origin of Species.' There is the Lamarckian or older camp, and the Darwinian or newer one. The former asserts that organisms are profoundly modified by the necessities of their existence and the nature of their physical environment, and that these modifications are hereditarily transmitted, accumulated, and perfected with each generation. The Darwinian camp, on the other hand, asserts that variations are fortuitous, that they arise spontaneously from some inherent cause of which we know nothing, but that having arisen, they can be either advantageous or otherwise to the organism. If advantageous, then they confer a benefit and advantage upon the organism possessing them, which the others do not possess; and that therefore in the struggle for existence the former will survive and procreate their species, and the latter will become exterminated. Thus Nature selects the fittest to survive and rejects the unfit, and hence to the Darwinian theory has been given the name of Natural Selection. Thus may be explained why organisms are adapted to their environment; not because, as the Lamarckians assert, Nature has indiscriminately moulded them to it, but because those not so adapted have become exterminated."

It is no part of our purpose to even mention the various arguments for and against these opposing views, every field naturalist can and should become acquainted with them from zoological text-books. What we wish to do is simply to take the case of the slow-worm as an example of a species which has arisen as the result of variation, and apply the two views to it.

We may suppose that the ancient four-limbed lizard, according to the first of the views enunciated, found itself in the course of time, and in some circumstances of its distribution, under the necessity of taking to a burrowing life or living in loose sand, or in some other condition in which the limbs were not well adapted for locomotion. What the precise nature of the environment was does not matter. Whatever it was, "the organisms are profoundly modified by the necessities of their existence, and the nature of their physical environment." That is to say, that this lizard, *because of this environment*, became modified in structure, in the direction of the reduction in size of the limbs. These modifications "are hereditarily transmitted, accumulated, and perfected with each generation." The first lizards to have smaller limbs transmitted them to their offspring; the process continued; they in their turn were still further modified in the same direction, and transmitted their still smaller limbs to their offspring. The process is "perfected with each generation," until, finally, as the result of the effect of their environment, the lizard has no external limbs left at all. Thus a new species of lizard has arisen, without limbs, and at the same time some may be still in a transitional stage, with small limbs, or the hind pair only, showing the intermediate condition. We may represent the process diagrammatically thus:—

$$\left\{\begin{array}{l}\text{Male (long limb)}\\ \qquad\qquad\text{have offspring}\\ \text{Female (long limb)}\end{array}\right. \left\{\begin{array}{l}\text{Male (short limb)}\\ \qquad\qquad\text{have offspring}\\ \text{Female (short limb)}\end{array}\right. \left\{\begin{array}{l}\text{Male (limbless)}\\ \\ \text{Female limbless),}\end{array}\right.$$

the structural change being due to—

(*a*) Action of the physical environment;
(*b*) Hereditary transmission of these acquired characters;
(*c*) Accumulation and perfection in succeeding generations.

It is to be particularly noted that according to this view the cause of the variation in the lizard is something extraneous to itself—its environment, in the first place,—and that the variation having once occurred, is transmitted by the influence of what is called heredity.

On the other hand, according to the Darwinian view, the initial factor in the variation of the four-limbed lizard is not to be sought for in extraneous circumstances such as environment, but in the inherent nature of animal life. All admit that the variations take place, but the newer theory is that these variations arise *spontaneously*. That does not mean that they arose in a haphazard way necessarily, but that they are the result of the operation of a law concerning which we know nothing. It means that it is the property of germ plasm to vary, whether the environment changes or not. The result of these variations may be useful to the creature or otherwise. In this case, if one of these spontaneous variations in the lizard took the shape of a reduction in the size of the limbs at a time when limbs were rather in the way than otherwise, then that variation would confer an advantage upon those individuals in which it occurred. If their life depended upon being able to burrow or otherwise protect themselves in some special way which limbs interfered with, it is obvious that the members of the race which had this new character would be the survivors in the struggle for life. If the circumstances which made this a useful variation continued in operation, those which had not thus varied would in time become exterminated. The offspring of the lizards with the reduced limbs would also have this character, some to a greater degree than others, and those in which it was most marked would in their turn survive. They would vary in their turn, and so the process would finally result again in a species of lizard without limbs. In this case the spontaneous variations have in some instances been adapted to the environment of the creature, and therefore have conferred upon it a commanding advantage, enabling it to survive where others have become exterminated. The environment has not caused the variation during the life of any given members of the species, but these members have given rise to offspring which have varied from their parents, simply because all offspring do vary more or less from their parents. They have thus become adapted to their environment, and given rise to a new species. According to this view, only a certain number of offspring possess the advantageous variation, and they are selected to survive. It only requires that a male and a female each possessed of the new character should pair, in order that it may be possible for the variation to become permanent and intensified. It thus appears that some very profound modifications may arise suddenly, as the result of this spontaneous variation, and in such a case the intermediate stages may be non-existent. We may represent the origin of the limbless lizard on this view thus:—

Male (long limbs)
Female (long limbs) } offspring
Male (long limbs)
Female (long limbs) } no variation.
Female (short limbs, a spontaneous variation conferring an advantage).

If a similar variation arose in a male of the same or another litter, and the two spontaneous variations paired, the result would be—

Male (short limbs)
Female (short limbs) } offspring a short-limbed family, a new species.

And similarly with other variations of kind or degree.

This brief outline of the two main biological views on this subject is merely intended to direct the attention of the field naturalist reader to the explanations offered by science to account for the origin of such an anomalous reptile as the slow-worm is, as well as for the origin of species in general. It merely touches the fringe of the greatest of all biological subjects, and of necessity ignores all the numerous sidelights which may be thrown upon it; but it is hoped that it may be just sufficient to induce readers to examine the matter for themselves, and apply what they learn to the species of animals in their own country.

It remains to be noted what degrees of variation in the matter of limbs are to be found existing at the present day amongst lizards, which may be regarded as connecting links between the ordinary four-limbed type and the absolutely limbless species of which the slow-worm is an example.

It has been said that a burrowing habit, or a life amidst sand, might be regarded as conditions under which limbs would be not altogether an advantage, and, as a matter of fact, it will be found that it is precisely in those lizards which live under these conditions nowadays that this partial or complete absence of limbs is to be observed. It is, too, almost certain that the laws of the past in biology have been very similar in their methods of operation to those of the present.

Along with this reduction in the size of the limbs in lizards is found an elongated trunk or body, approaching the shape of that of a serpent. This is seen, for example, in the slow-worm. This long body may be associated with a shortened tail or not; in the slow-worm the tail is as long as the body. In many-limbed lizards the tail is, of course, considerably longer than the body, as in the viviparous lizard. Then we find that in the limbless lizards there are some vestiges of the limbs or limb girdles usually found under the skin. Those of the hind-limbs lie immediately in front of the anal aperture. A very interesting point is that the fore-limbs disappear before the hind-limbs, or are frequently smaller than the hind-limbs. Some species have hind-limbs only, while rarely the opposite condition occurs, *e.g.* in *Chirotes canaliculatus*, a species found in Mexico and California, in which there are still fore-limbs with four clawed digits. This family (Amphisbænidæ) includes a number of species which are burrowing in habit and limbless; *Chirotes* being the only species with limbs. In most cases the pectoral and pelvic girdles are to be found in a vestigial condition; but in one family (Dibamidæ) not merely the limbs, but the limb girdles also are absent, though in the males there are flaps which seem to indicate limbs. The family to which the slow-worm belongs (Anguidæ) seem to be in a state of change, there being a general tendency to reduce and lose the limbs, which "may be more or less developed, or entirely absent externally, in which case, however, the rudiments of the pectoral and pelvic arches are always present" (*British*

Museum Catalogue, G. A. Boulenger). Another member of the slow-worm family (*Ophisaurus apus*) possesses external rudiments of hind-limbs. This last species is of interest because the shape, arrangement, and number of the head shields are extremely similar to those of the slow-worm. It is known as the glass snake, and is found in South-Eastern Europe, South-Western Asia, and North Africa, growing to a length of 3 feet. Finally, in this connection may be mentioned the genus *Chamæsaura*, a South African genus, with three species which exhibit a curiously progressive diminution in the limbs which may be thus summarised:—

1. *C. ænea.*—Both pairs of limbs present, pentadactyle.
2. *C. anguina.*—Both pairs of limbs present, reduced to stumps (styliform and undivided).
3. *C. macrolepis.*—Fore-limbs absent; hind-limbs styliform, undivided.

A more gradual and complete reduction is seen if the whole of the genera in the slow-worm family be compared. Thus:—

SYNOPSIS OF THE GENERA IN THE ANGUIDÆ.

1. *Gerrhonotus.*—Limbs four, pentadactyle.
2. *Ophisaurus.*—Limbs absent, or hind pair rudimentary externally.
3. *Diploglossus.*—Limbs four, pentadactyle.
4. *Sauresia.*—Limbs four, tetradactyle.
5. *Panolopus.*—Limbs four, monodactyle or didactyle.
6. *Ophiodes.*—External rudiments of the hind-limbs only.
7. *Anguis.*—No trace of limbs externally.

Here we have in the one family a number of genera exhibiting a series of variations, from the four-limbed five-fingered type to the highly specialised serpentiform creature without any external limbs at all, as in the slow-worm. It is the existence of so many intermediate conditions of organs that prove animals to be connected by almost every possible structural modification, and which makes it impossible to believe that species could have arisen except by a gradual transition of forms from the generalised type to the specialised, by means of natural selection acting upon ever-occurring morphological variations.

It naturally follows that locomotion in lizards will be of different kinds, according to the state of development or absence of limbs. The two extremes are, of course, the quick, running movements of the lizards with perfect fore- and hind-limbs, and the quiet, gliding motion of the entirely limbless forms, like the slow-worm. In intermediate forms the method of progression is likewise modified, sometimes exhibiting bipedal locomotion, the hind-limbs only being used. If the four limbs are very small in proportion to the body, the locomotion is correspondingly sluggish. Along with the variations in the limbs themselves there have occurred alterations in the muscular structures to enable the reptile to adopt the new mode of locomotion, and other organs have become similarly modified for their particular functions in the changed conditions of life.

It is only necessary to study the respective movements of different kinds of lizards to appreciate what a wonderful amount of specialisation has taken place in connection with this function alone, and the reader who would pursue this interesting topic is recommended to turn his attention to the geckos, skinks, and the slow-worm, to observe the immense variety of movements which have resulted from structural modifications. He will then naturally turn his attention to the question of the relationship of the lizards to the snakes, observing that in some families, that of the boa-constrictor for example, snakes have external indications of limbs in the shape of spurs, a subject which is beyond our province here.

The general conclusions to be drawn from an examination of all the lizards which exhibit some stage of degeneration in the limbs, are summed up by Professor Cope somewhat as follows:—It is obvious that degeneracy of the scapular and pelvic arches to which the fore- and hind-limbs are attached when present, sooner or later follows partial or complete loss of the limbs themselves. In the Diploglossa (lizards with papillose tongues), the fore-limbs have disappeared more generally than the hind-limbs. In the skinks the limbs incline to degenerate more equally, the fore- and hind-limbs tending to be at the same stage. In one or two groups it seems that the fore-limbs have a tendency to persist longer than the hind-limbs. The scapular arch remains long after the degeneration and loss of the fore-limbs, before it degenerates itself, while the pelvic arch degenerates previously to the loss of the hind-limb.

The various parts of the scapular arch degenerate in the following order:—(1) limb; (2) interclavicle (generally); (3) costal attachment; (4) sternum.

The order of disappearance of the parts in the pelvis is:—(1) pubis and ischium together (generally); (2) limb; (3) ilium.

"The conclusion that the rudimental condition of arches and limbs is due to degeneracy is supported by palæontologic evidence, which shows that the ancestral orders of the Reptilia (Cotylosauria and Theromora) had well-developed limbs. Similar evidence shows that the Sauria and Ophidia had a common ancestor."[1]

Compiling County Faunas—Insects.

By Claude Morley, F.E.S.

Interesting as it would be to trace back, wherever such a course were possible, all those varied and strange forms of animal life that have at some past period in historic and prehistoric time existed within a given radius, the difficulties are so great that the palæontology of our individual counties is very imperfectly known, and we find it a sufficiently laborious task to come at those species which are still to be found within its limits. Since the collating of local catalogues of this nature is one of the objects which should be of primary care in our naturalists' field clubs, a word from one who has done some little work in this direction may not be without interest to those contemplating a similar study.

And in all the animal kingdom no group is more extensive than that known as the insects, and few probably call for more especial toil, since the various species of which the whole is built up are, to a very large extent, restricted to certain habits—often to a certain kind of food-plant which, again, is only to be found growing upon certain formations of supersoil. There are three very distinct methods which must be combined in working up such a catalogue, the most important being, of course, genuine field work; to go out and take the species in the district is the very best and most positive method of knowing that they occur there, though it must be borne in mind that imported species will often turn up. Exactly what is to be considered an imported or an indigenous species must depend largely upon personal opinion. The cockroach, for example, is undoubtedly imported (cf. *F. N. Q.*, ii. 36), and yet it has for so long a time dwelt with us that it is assuredly become a British insect. The great Longicorn beetles, on the other hand, which have been brought from abroad in timber to our port-towns in the larval state, have there hatched out, and been discovered perambulating the quays, cannot be thought truly British by any stress of imagination, simply because they are taken in Britain. In January 1901 a specimen of *Coryphocera elegans*, Fab., was imported into Ipswich in linseed from Calcutta; this is a lovely insect, related to our Rose Beetle, but larger, with a coat of brilliant green, resembling enamel; in India and Ceylon its caterpillar feeds upon decaying vegetable matter; but, as it has never been "found in Britain" before, and its presence in the linseed was undoubtedly accidental, it cannot be considered indigenous.

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[1] Cope, *Crocodiles, Lizards, and Snakes*, p. 206.

In working a given district, every part of it, as far as is practicable, should be explored, more especially if the geological formations of one part differ to any appreciable degree, as is nearly sure, in an extended area like a county, to be the case; the prevalency of species will be found to vary very materially with divergent physical features which are controlled by the subsoil. And the sandy soil, with its sand-loving plants, will always be found the most prolific, at all events among the beetles.

The second method of compilation is the searching out of local records throughout the whole mass of entomological literature, the extent of which is far greater than anyone who has not tried to wade through it would conjecture; it is being constantly augmented by the publication of new works, and shortly it will become a very serious task indeed for such a compiler to run down his records in all the publications that are issued. These are of three kinds: first, there are the standard books, published in a lump, and disposed of individually as soon as their perusal is completed; secondly, there are the standard periodicals, such as *The Entomologists' Annual* (now discontinued), *The Annals and Magazine of Natural History*, and *The Entomologists' Monthly Magazine*, running through a great many yearly volumes; and thirdly, there are the periodical publications of the various more or less important naturalists' societies, chief of which are recognised the *Transactions* of the Entomological Society and of the Linnean Society. The extraction of records from this formidable array is a matter of time and patience not to be shirked; and one's patience is often further stretched because doubt is sometimes left as to the synonymy of the names you will there find printed with those in general use nowadays. This incongruity can sometimes only be cleared up by a visit to, and an examination of, the actual specimen recorded when it is obtainable, which, through the death of the recorder or dispersal of his collection, is rendered a difficult, and often impossible, matter.

The third and last method of adding to your catalogue is too often entirely neglected by local compilers; it is not very prolific of fine results, but sometimes rare things are dropped upon. It is simply the cultivation of the rustics. You meet a keeper in a wood—a contingency usually to be avoided!—you cultivate him, and sometimes you find he has picked up something curious, at which he would like you to look. You go home with him, and he shows you a cardboard box containing a battered *Æschna* or *Apatura*, which had been hitherto unknown to occur in the district. Or you see an ancient dame knitting in her porch, and gradually draw the information that her dear departed had set up a primitive case of "flies," among which something nice not infrequently is to be found.

I don't believe there is an English—much less a British

—county whose insects are fully known; but with the present rate of initiation of general naturalists into the intricate mysteries of insect-lore, our local knowledge is growing apace, and already we are able to some extent to compare the moths and beetles of many of the better worked. What is wanted is a headquarters for recording, with men who will act as voluntary observers in every part of the kingdom. This would not only expedite our local knowledge of the subject, but would also greatly conduce to the perfection of Entomological Science in general.

Our Common Wild Birds, and How to know Them: An Attempt to help the Young Ornithologist.

By W. GYNGELL, *Scarborough Field Naturalists' Society.*

(*Continued from p.* 229.)

THE Blackbird (*Turdus merula*). Having done with those British birds which a visitor from the tropics to England once described as "little brown birds like sparrows," with the present species we will commence our rough description of the larger British birds, still endeavouring to help those who have not yet opened their eyes to the bird life around them. It is almost impossible for the poorest and least favoured resident of Britain, or at least England, to take a walk in a country lane, a town park, or by suburban gardens, without seeing and easily knowing the above-named bird, which, though much larger than a sparrow, is much less than a tame pigeon. It frequents gardens, low trees, and more especially hedgerows, and when disturbed flies away uttering a quick, loud, and aggresive alarm note—"*chuck*-it, *eye*, kit-*eye*, kit-*eye*, kit-*eye*, kit." When it alights it always raises its tail. The bird being *entirely black*, except for its rich *orange-coloured beak*, it is very easily identified, and it being also a common cage bird, it needs no further description. When we know the cock bird we shall easily identify the hen, which is of a deep brown colour in plumage and beak.

The Ring-Ouzel (*T. torquatus*), being a common bird only in high moorland or mountain districts, usually far from woods, gardens, and the haunts of men, need not be looked for by those who live in the flatter parts of our island. It very closely resembles its near relative, the blackbird, but has a *broad white gorget upon the breast*, by which mark it may be easily known.

The Song-Thrush (*T. musicus*), about the size of the blackbird, is, however, very different in appearance, though usually equally abundant in the same haunts, and still more common as a cage bird. We soon identify it by its light brown back and beautifully speckled breast. It haunts gardens, lawns, and hedgerows, where it may be seen almost any day, moving with a succession of long hops, stopping now and then to look about in a knowing way or break up a snail on a stone. In the spring its loud and beautiful song may be heard almost everywhere in Britain. The song-thrush, throstle, or mavis, as it is often called, is not easily mistaken for any other bird but

The Mistle-Thrush (*T. viscivorus*). This bird is, however, *much larger*, and so shy that he does not so often come into gardens, though may occasionally be heard in early spring singing his few loud notes from the top of some tall tree. When disturbed, the mistle-thrush flies away with a scraping alarm note like the sound of an old-fashioned child's rattle. You may know him also by his lighter colour and the *more conspicuous dark spots* upon his *lighter coloured breast.*

The Fieldfare (*T. pilaris*) is another large spotted thrush which visits us in winter, when it may often be seen in large flocks either flying over the fields and woods or spread out all over the fields feeding. We know this bird most readily by its loud and frequent call-note—"chuck-uh, chuck-uh; yock-uh, chuck-uh, chuck-uh," which often betrays the presence of a flock before we see the birds; but a near view shows us its own peculiar markings, the most noticeable being the contrast of the *chestnut-brown back* and *slate-grey rump.*

The Redwing (*T. iliacus*) is the smallest of our thrushes, and a winter visitor chiefly in severe weather. It is much like the song-thrush, but may be known by the *orange-red* colour of the *flanks and under side of its wings*, very noticeable in flight. When hard weather enables us to get close to the redwing, we may also see the very distinct *whitish streak over the eye.*

The Water-Ouzel or Dipper (*Cinclus aquaticus*) is only found in mountain or moorland districts, where rapid streams rush and tumble through rocky ravines, though the bird sometimes comes farther down these same streams to the level of the fields. Unlike any other British bird in habits and appearance, we easily identify it. Following up or down the beautiful beck which he always makes his permanent home, we soon catch sight of him taking his favourite bath in the pool below the fall, or sitting on a rock *curtseying*, from which habit he takes the name of Dipper. About the size of a song-thrush, though having a *short tail*, he is *sooty-brown above* and has a brilliant *white throat and breast.* We have just time to see this before he is off with rapid flight straight up or down the stream, calling—"tzit, tzit, tzit."

The Starling (*Sturnus vulgaris*) is also about the size of a thrush, and we may see him any morning before breakfast by looking out of the bedroom window, for he is almost sure to be singing on the roof or a neighbouring chimney-pot, all the time shuffling his wings. He appears to be black, but on a nearer inspection his dark and glossy plumage is seen to be *beautifully spangled with yellowish spots*. His song, too, is characteristic, and made up of gurgling, guttural notes and squeaks, and sounds like running machinery. This is the bird which in little parties runs about on lawns and fields, poking in the grass for worms, etc., and seemingly constantly quarrelling. They are almost everywhere in Britain as common as sparrows.

The Rook (*Corvus frugilegus*). This is the large black bird, larger than a tame pigeon, which we so commonly see in flocks feeding together in the fields, flying overhead together calling "caw-caw," or in spring-time busily engaged with their large nests in the tall, bare trees, their colonies being called rookeries. Unfortunately for the young naturalist, this bird is very often confounded with the crow, which is a bird of solitary habit. If we look carefully at the birds in the rookery we shall see that they are entirely black, *excepting for the bare grey warty skin about their faces*, and this is the easiest means of distinguishing the rook from

The Carrion Crow (*C. corone*), which rarely or never comes into towns nor associates in flocks, but haunts the wilder parts of the country, chiefly wooded hillsides, cliffs, and ravines, where it is generally to be seen singly or in pairs. The base of the beak and the *entire face* of this bird *is black*, otherwise the two species are very similar, but a naturalist soon notes a difference in the voice, the notes of the crow being harsher. The rook calls "caw," the crow "cah."

The Hooded Crow (*C. cornix*), a resident in Scotland and Ireland, only visits England in winter, and is even then there chiefly confined to the eastern counties. In size and habits, though not such a shy bird, it is the counterpart of the last-named, except for the plumage of its *back and under parts being ash grey*. There is no possibility of mistaking it for any other British bird.

The Jackdaw (*C. monedula*) is distinctly smaller than his relatives, the last three birds, and is entirely black, excepting the *nape of the neck*, which is *ash grey*. His acquaintance is generally very soon made, for he is on most friendly terms with the rooks, commonly associating with them in their rookeries, flying with and feeding with them in the fields, where his smaller size and quicker movement of the wings further help us to identify him when seen at a distance. An abundant bird in most districts, he frequents church towers, and other tall buildings and cliffs. He is a chattering, lively bird, constantly calling "*chack*-ah, *chack*-ah, *chack*-ah" to his mates, and sometimes a deeper "chah-h-h."

The Jay (*Garrulus glandarius*) is about the size of the jackdaw, and is fairly common in many woods and thick copses, where, before we see the bird, we may often hear his harsh screaming note—"scrark, scrark." Following the sound, we catch a glimpse of a bird showing much more bright colour than most British species. *The large patch of white on the rump*, conspicuous as the bird flies, will probably first attract our attention, then we notice that the back is of a *light wine colour*, and there is some *black about the wings and tail.* If we get close enough to this wary bird, we shall also observe some *bright blue* upon the wings, but it *is* a wary bird, and is almost sure to see us before we see it.

The Magpie (*Pica rustica*) is another offshoot of the crow family, and of about the same size as the last two birds. *A large black-and-white bird* with a *very long tail*, needs no detailed description. Its flight is heavy and laborious, like that of most long-tailed birds. When disturbed in its favourite plantation, it often utters a rapid chattering cry, "chack-a-rack-a-rack." No large bird is more easily distinguished than the magpie.

The Cuckoo (*Cuculus canorus*). To the novice there is no more easily recognisable bird sound than the voice of the cuckoo, one of the first country sounds which we all learn and from childhood are able to imitate. Comparatively few people, however, know the cuckoo by sight; so all young naturalists, when they first hear the bird call its name, should follow up the sound and get as close as possible to the bird, which will probably be calling from some tree in the fields, or a stone wall if in a moorland district. When disturbed, a bird about as large as a pigeon will be seen to fly away rather leisurely to another tree or wall at some distance, whence probably within a few seconds he will cuckoo again. We have noticed the bird's easy, skimming, straight flight, with rapid though gently beating wings, and in future shall know it when seen but not heard. The colour of the cuckoo's plumage, grey above and white streaked with grey below, will scarcely help us to identify it when seen out of doors, because probably we shall not get close enough to it to note these points; and for future guidance we may here say that usually the manner of the bird, and the circumstances under which we see it, will be a better guide to identification than details of plumage, which are difficult to distinguish in most large birds when, as is so commonly the case, we see them hurriedly or at a considerable distance.

The Nightjar (*Caprimulgus europæus*). Often when crossing a heather or furze-covered moor, or walking through the bracken in an open glade in the woods, we may disturb a bird about the size of a pigeon, which rises close to our feet and skims away close to the ground, flying somewhat like an unsteady swallow. As suddenly as it rose so it disappears, dropping into the bracken again, and leaving us with the impression of a bird of mottled owl-like plumage and somewhat suggestive of the cuckoo in general appearance. We follow it up, and just when we are almost close enough to see it, up it gets again and repeats the action. Or it may settle upon a railing or horizontal branch of a tree, where it will squat down *along the branch, not perched across it*, with its head level with its tail. This is the nightjar as we know it in the daytime, but to *hear* the bird at *night* is one of the most interesting experiences which falls to the lot of a naturalist. The curious *vibrating, churring note*, like the distant sound of a threshing machine, heard in the otherwise still silence of the night is most weirdly fascinating.

The Green Woodpecker (*Gecinus viridis*). This is generally the commonest British woodpecker, and is found in most of our larger woods. Not quite so large as a pigeon, its *plumage of green* and *yellowish green* is quite unlike that of any other British bird. It also has conspicuous markings of *crimson and black about the head*, which help to make it a handsome bird. Its loud laughing or yelping cry—"hyi-hyi-hyi-hyi," unlike any other sound in the country, may be heard at a great distance. When we see a large, yellowish-green bird flying through the woods or over the fields, we may be quite certain that it is the green woodpecker.

The Great Spotted Woodpecker (*Dendrocopus major*). About the size of a starling, this is one of the smartest looking British birds. It is found in woods and parks, and in many parts of England is quite as common as the green species. Its *black plumage, spotted and barred with white*, its white under parts, and the *crimson nape and tail-coverts*, give it a most elegant appearance. We usually see it climbing up or down, or slurring sideways round a tree, but are often made acquainted with its presence by hearing its call—"chook, chook."

The Kingfisher (*Alcedo ispida*) is generally admitted to be the most beautiful of all British birds. About equal in size to the last named, we shall not wait long before making its acquaintance by almost any riverside in Britain. A bird so gorgeously coloured that it seems like a flash of rainbow lightning as it flies swiftly along a stream needs no detailed description, but we may say that it is mainly *blue and greenish blue above* and *chestnut-red below*. The way to see the kingfisher is to walk quietly along the river banks, watching carefully for any bird that may fly up or down stream. We may, however, often surprise it when we cross a river bridge, and, as a naturalist will always do, approach quietly so that we may see whatever may be on or near the water before we ourselves are seen.

The Tawny Owl (*Syrnium aluco*), also commonly called the *Brown* Owl, is more frequently *heard* than any of its kind, and is the largest of our common British owls, being, roughly speaking, equal in size to a small fowl. In most woods, properly so called, its loud hoot may be heard at any hour of the night, and is to our ear one of the most melodious sounds of the country. Like a low deep whistle—oo-*oo*-oo-oo, oo-oo-oo-oo-oo-oo, the hoot is almost always in two musical bars, four notes in the first, and six, somewhat fainter and quicker, in the last bar. It is *always* the *tawny* owl that thus hoots; and if ever in the daytime we disturb a *brown owl* from a *hole* in a tree or quarry, we may be quite sure that it is this species. We may also sometimes come across this bird in the woods, sitting on a branch close to the tree trunk, but only a practised eye can then distinguish the bird from the tree, for the harmony of colour is perfect. The tawny owl almost exclusively inhabits woods of oak, beech, and other deciduous trees.

The Long-Eared Owl (*Asio otus*), a smaller bird than the last, is almost entirely confined to the *fir woods*, where in many districts of Britain it is the commonest owl, but they are generally difficult to find. During the day they commonly roost on old nests of wood-pigeons, upon which they also lay their eggs in early spring. The two tufts of feathers which stand straight up from the crown of the owl's head, and the bird's bright yellow eyes, give it a very striking appearance. Really the best way to see one is to go bird-nesting, and climb the fir trees, spruce or Scotch, which contain big nests, and then we may get within two yards of the bird before it silently flits away. Its presence in a wood is generally indicated by the bird's cast-up pellets of fur and bones which strew the ground below its roosting-place.

The Barn Owl (*Strix flammea*), in some places known as the *White* Owl, is the most delicately beautiful of all the family. Not uncommon in some districts, it may be easily distinguished when seen on the wing—and it often flies early in the evening—by its *pure white plumage*, for although the bird's upper parts are orange-buff with delicate markings, it is apparently a *large white bird* that we see flying. Church towers, cliffs, old farm buildings, and large hollow trees, are its favourite haunts by day. When abroad in the evening it is impossible to mistake it for any other owl, or indeed any other bird, as it gently flaps its way silently along a hedgerow or round a building.

The Kestrel (*Falco tinnunculus*), though we wish it were commoner, is still one of the most noticeable birds of the open country. It is our commonest hawk, and may easily be known by its remarkable habit of steadily hovering in the air over field or meadow, as though hanging suspended from the sky. As it hovers, with spread tail and quickly quivering wings, the bird apparently neither moving up, down, nor to the right or left, it is a sight beautiful and without parallel in bird life. After hovering for some minutes, it will either drop straight to the ground and secure its field-vole, or wheel round, hover again, and then sail away across the fields. When seen from above, the kestrel, which is about the size of a pigeon, appears chiefly of a reddish-brown colour, though the smaller male bird is bluish grey on the head, neck, and tail.

The Sparrow-Hawk (*Accipiter nisus*) is about the same size as the kestrel, and, though much less easily detected, is more common than generally supposed. As with rapid, dashing flight it skims over the fields and through woodland glades, snatching up its prey, usually a small bird, before its victim is aware of its presence, its actions are very different from those of the kestrel. Seen from above, the sparrow-hawk's dark grey back always serves to distinguish it from the kestrel when other means fail. The small heaps of feathers which we occasionally find in the fields generally denote the presence of this hawk, and tell the tale of its last victims.

(*To be continued.*)

Nervous Mechanisms of Plants.

By E. M. Wood, *Liverpool Naturalists' Field Club.*

THERE has been a good deal of sentimental nonsense written about the instinct and intellect of plants! It is really quite absurd that plants should be credited with powers of discernment, almost amounting to reasoning, to the extent to which some folks would go. For example, in an article in one of the London dailies recently, a writer notices with awestruck wonder the behaviour of a bed of mint, which flourished happily enough in a garden until a pig-sty was erected near by. The mint was so disgusted at the advent of its unsavoury neighbour that it transplanted itself into a colony of sweet-smelling flowers at a respectable distance from its old position!

This is the sort of fairy tale which may please some people, but makes a laughing-stock of a delightful and wonderful science. There is little necessity for us to stretch our imagination to such telescopic lengths to perceive far-fetched miracles, when there are really so many phenomena nearer home, wonders about which we are apt to talk so glibly, and about which, after all, we know so uncommonly little.

We air our acquaintance with protoplasm, vital force, and transmission of stimuli, but when the outward and visible signs of these invisible forces are presented to us in perfect working order, then are we struck with astonishment, like unto the astonishment of a small child beholding the face of a clock whilst the works are perfectly hidden from sight.

Spontaneous movement has not always been accredited to plant life; whenever there was protoplasm capable of movement, it was always labelled as "animal" life; but scientists have discovered, and assure us, that protoplasm, whether it is found in animal or vegetable bodies, is capable of movement under certain conditions. There is a variety of movements in plants due to numerous causes. There is the spontaneous flow of circulation of protoplasm in living cells, and the spontaneous movements of plants during natural growth. Other movements than these require a stimulus from outside to set the machinery in motion. The elements which stimulate plants are heat, cold, light, and moisture, whilst contact with foreign bodies and chemical stimuli are responsible for the actions in some cases. The fact that the living protoplasm of plant cells communicates through the walls of those cells from one to another is sufficient to lead us to the conclusion that this must be the means by which telegraphic messages are conveyed from the outer cells, which directly receive the stimulus, to the inner ones, so that the whole system of cells shall work in concert.

This fact makes the theory of nerves in plants more clearly acceptable, if with reservations. If there *are* nerves in plants they are only rudimentary ones—nerves which in animals are much more highly developed and localised according to their powers. If, as has been suggested, the highly organised power of sight in animals is echoed, however faintly, in the actions of plants under the influence of light, may not taste and smell have something to do with the phenomena of chemiotaxis as well as chemical affinity? Hearing alone seems to have not the slightest trace of existence in the marvellous catalogue of plant senses. Touch, of course, is even more distinctly apparent than any of the foregoing. Here, indeed, we have wonders which are quite deep enough to puzzle the wisest, so that we need not concoct absurdities which may not be supported for a moment, finding that the borderland between the powers of the animal and vegetable creations is much narrower than we had dreamed. As in animal life certain senses or functions are suspended when the creature is out of health, so also plants must have the necessary "tone" if the "nerves" are to act properly, or sufficiently to exhibit their powers. Localisation of sensation is also to be noticed as important in plants which show movement of any kind. Some have the power of motion in their leaves, others in their flowers; in others the stamens only can be affected, in others the stigmas alone. All these movements are not merely done for effect, but are of some distinct advantage to the well-being of the plant, either as protection from injurious influences, in the interests of pollination or fertilisation, or for the food supply. The agents which influence some plants to a large degree are perfectly useless to stimulate others, sometimes even when the same object is to be attained. For instance, the leaf of a Venus' fly-trap will close at the touch of any object, whilst the sundew will not close its tentacles unless nitrogenous material is introduced, both plants requiring nitrogen—but one showing its hypersensitiveness to a chemical stimulus, whilst the other will waste a lot of time and energy in the pursuit of a shadow!

The terms sensitiveness and irritability are both used to denote the effects on plants or their special parts from various causes.

Irritability we may conveniently consider as being the result of mechanical and chemical stimulation, whilst sensitiveness may convey the idea of irritability in a modified degree, although there is but little difference between the terms.

Irritability conveys the idea of sudden or distinct movement on the part or parts affected by an outside cause, and sensitiveness the slower realisation of some stimulating cause.

It is strange that there should be plants which are apparently stolid and unaffected by atmospheric and other conditions, whilst there are others immediately affected by the slightest disturbing element. Some flowers open and close at the approach of light or darkness, others are unmoved. The clover and the wood-sorrel fold up their foliage leaves as night or cloudy weather comes on, whilst the leaves of hundreds of plants around them are quite unchanged.

There are a few notable examples, familiar to most students, illustrating as well as possible the phenomena of nervous mechanisms.

Mimosa pudica, the sensitive plant, growing wild in hot countries and occasionally seen in greenhouses in this country, has remarkably sensitive compound pinnate leaves, which on being roughly handled or shaken bend downwards, the pinnæ also closing together. At the approach of night the leaves are said to behave in the same manner. At the base of the leaf-stalk, and at the bases of the petioles of each leaflet, there is a mass of cells called a pulvinus, composed of parenchyma, which directly the leaves are agitated lose their turgidity and fall, unable to support the weight of the leaf. Directly each cell becomes filled with water again the petiole returns to its usual position. This may be done to frighten away browsing animals, or to give the plant an appearance of withering.

The common yellow *Mimulus*, the Monkey Flower, of our gardens, usually handsomely speckled with rich claret brown, as well as the wild *M. luteus* and the sweet-smelling musk, exhibits a curious movement of the stigma. The stigma in all the species is composed of two broad divergent lobes, usually rolled back from one another. On being touched these lobes close rapidly up and lie flat, one on the other. No doubt we have all, at one time or another, sat playing interestedly with a plant of *Mimulus*, tickling the lobes of the stigmas with a pencil or other handy weapon, watching the closing stigmas, or waiting for their gradual rolling back again open-mouthed as before. This wonderful little trap-like action is to ensure the pollen, brought by a wandering insect, adhering to the stigmatic surface. We find that both the inner and outer surfaces of the lobes are irritable, and that the movement goes on repeatedly, even when the corolla has fallen away from the calyx (as is so quickly the case), until pollen is received upon the stigma, and it is active no more.

Another instance of rapid movement is to be seen in stamens of the Barberry, either *Mahonia* or *Berberis* will serve for the experiment, the former is the better flower as it is the larger. The stamens stand in a ring within the petals and surrounding the pistil; if the base of one stamen is touched the whole stamen falls quickly forward towards the stigma, or the body of the insect which has set up the excitement.

This is to ensure pollination, and probably the stamen loses all its pollen at one stroke, as it never regains its old position. Each stamen is capable of independent action.

The stamens of *Centaureas* are irritable when touched, for you can see the stamens jerk spasmodically when the fingers are passed quickly over the flower-head.

The Venus' Fly-Trap (*Dionæa*), a carnivorous North American plant, has bright green root-leaves, which lie spread on the ground in a circle round the central flower-stalk. Each leaf is composed of a flattened petiole and a broad lamina on either side of the midrib. The edge is fringed with teeth, and near the midrib are six bristle-like hairs, three on either side. When one or more of these hairs is touched the two lobes of the lamina close together fairly rapidly and open again in a few minutes. If a fly or any nitrogenous body causes the irritation the leaf remains closed for a week or longer, until the juices of the insect become thoroughly absorbed.

The Sundews (*Droseras*) are carnivorous plants, usually growing in peat bogs, either in sheltered lowlands or moorlands at a fairly high level.

The plant called the Round-Leaved Sundew must be well known from the frequency with which it appears on the pages of every book treating of plant wonders, if, indeed, the rosettes of green leaves covered with glistening crimson hairs or tentacles are not already familiar to most of us in its native bogs. Here is a plant which lays itself out for the capture of insects in a fashion resembling the *Dionæa*, but where the movement of the whole leaf is replaced by the movement of the tentacles only, the leaf becoming curled up slightly by reason of the bending of the tentacles. But it is only a nitrogenous body which causes the glands to secrete their viscid fluid, bending over the unhappy victim. The sensitive area is strictly confined to the gland on the apex of each tentacle, and the case is one of entirely chemical stimulus.

The Butterwort is yet another British plant whose nervous system is irritable, being affected in the same manner as the sundew, the edges of the leaves rolling slowly inwards upon their prey, glued to the leaf by its viscid surface.

The effect of chemical stimulus is apparent in the phenomenon of "chemiotaxis," in which we have certain organs of plants, such as the archegonia of ferns and mosses, secreting malic acid, cane-sugar, and other substances to attract the antherozoids which come swarming round, and in this way fertilisation is ensured.

Sensitiveness, accompanied by slow and constantly recurring movements, is well seen in nyctitropism, or the "sleep of plants," under the influence of light and variations of temperature. We have already noticed that certain plants, such as the clover and the wood-sorrel, close up their foliage leaves at the approach of night or cloudy weather, as well as some flowers close their petals. How quickly some plants respond to the variation of temperature accompanying the lessening of light is remarkable, as the variation can be but slight, especially in the middle hours of the day, when some flowers regularly close their petals. Towards evening the temperature is decidedly lowered, and several plants fold up their leaves as a protection against excessive cold and moisture. The closing of flowers is mechanically due to the greater or lesser turgescence of the cells and the more rapid growth of the cells away from the direct rays of light. We have also instances of the sensitiveness of some leaves to intensity of light. Where great heat during the day would have the effect of bleaching or destroying the delicate chlorophyll, some plants turn the edges of their leaves towards the direct rays of light. Not only does the leaf in some cases assume a protective attitude, but the chlorophyll granules are said to actually move about the cells, taking up different positions in diffused light, bright sunlight, and darkness. A remarkable example of this "paraheliotropism" is to be seen in the cells of the Ivy-Leaved Duckweed (*Lemna trisulca*), which grows so freely in ponds and ditches.

The Hoopoe.

By J. L. Bevir, M.A.

As a boy lately come to a public school with a certain vague taste for natural history, nothing excited my fancy more than the statement of one of my seniors that he had seen a hoopoe sitting on the top of the bathing-shed—a fact which is recorded in the Wellington College N. S. S. report for 1868. I knew of its existence as an English bird from White's *Selborne*—"The most unusual birds I ever observed in these parts were a pair of hoopoes which came several years ago in the summer, and frequented an ornamental piece of ground, which joins my garden, for some weeks. They used to march about in a stately manner, feeding in the walks many times in the day, and seemed disposed to breed in my outlet."

The idea of the bird with its crimson crest fascinated me, and it pleased me in my schooldays to meet it again in its royal position in Aristophanes, and seemed quite a friend when I found the unfortunate Tyndarus in the Captivi making a pun on it, when he says, "For when I arrived (at the quarries), just as children of noble families have jackdaws or ducks or quails given them to play with, just so with me, there was a hoopoe (or pickaxe) given me to amuse myself with."

It was not till I became familiar with them in Corsica, where one sees them in numbers, that I understood the appropriateness of the allusion. I have often seen them settle on the stones between great tufts of asphodel, and set to work pecking and picking like the wooden ostrich of our childhood, which works with a swing balance under the table. When the weight swings fast the beak comes down with a sharp peck, but when it only swings slowly the neck gives a quaint little nod. This motion one gets too in the hoopoe, who is perpetually bobbing his head backward and forward. My brother, writing from the Upper Nile, says, "I think he is often called by the Arabs (aboo abad) the Father of Worship, from his constantly nodding."

To many the legend of the hoopoe's tuft, which is so charmingly told in Curzon's *Monasteries of the Levant*, is familiar, but I venture to give a shortened form of it. Solomon was making one of his journeys on the magic carpet when the sun struck hard upon the monarch's head. He appealed to several flights of birds passing to protect him, but they began one and all to make excuse. At last he appealed to some hoopoes, and their king answered, "O King, we are but little birds, but we will gather our nation together, and by our numbers we will make up for our small size!" In gratitude Solomon offered their king any reward for their service. The king of the hoopoes took a day to think, and then asked that they might have a golden crown on their heads. This was granted. There was, however, in those days a certain fowler who, by means of a broken mirror, caught some vainglorious hoopoes, and took the crown to Isaachar Ben Jacob, who gave him a quarter of a shekel for it, as being a crown of brass. But ere long it leaked out that the crown was of gold, and the Jewish fowler, intent on gain, pursued the unfortunate birds as relentlessly as the modern gunner does those straggling specimens which appear in England. In penitence at his vanity, the king of the hoopoes went to Solomon and related the misfortune that had fallen upon his race, and Solomon kindly changed the crown of gold into a tuft of brilliant feathers, "that ye may walk unharmed upon the earth." As above hinted, this promise has not been fulfilled, for the plumage of the bird and its flight still tempt man to destroy it, though, I believe, none but the unspeakable Turk have been known to eat it. As a rule, when flying, it is careless, and offers an easy mark; but, if frightened when on the ground, it spreads out its wings wide, bends its head so that the crimson crest rests on its back, and waits thus with the beak pointing upwards until the danger be past. The position is a clever one, for not only does its plumage assimilate with the surrounding light and shade, but its beak is in the best position to defend its body.

I have spoken of the past of the hoopoe and its existence in Southern Europe, but my object in writing was to secure some modern data as to its frequency and distribution in the British Isles. Gould speaks of it as having been found as far north as the Orkneys. Frank Buckland tells us that in 1891 two were shot "on the bank of the Midland Railway in the neighbourhood of Hampstead, in Gospel Oak Field." So, too, W. H. Hudson, 1897, speaks of it as "an annual visitor to our country, although in small numbers." Seebohm speaks of it as a regular summer migrant to the British Islands, and describes the nest. I have heard of it quite lately in Cornwall and Hampshire; but it would be interesting to know what records there have been of finding it during the last two years, for I fear that it is a rapidly vanishing species.

Why I am a Field Naturalist.

By W. Percival Westell, F.R.H.S., M.B.O.U.

Nowadays sports and games, hobbies and studies, are almost legion; but probably never in the history of the whole civilised world has there been such an appreciable increase in the number of people who take an intelligent interest in the fauna and flora of our country as during the last few years!

And, beyond this, there are a great many people in this restless, high-strung age who exhibit a keen delight in the pleasures of the countryside, but who, nevertheless, cannot be included under the category of those who take an intelligent, painstaking, and systematic interest in the wild tenants of our lanes and woods, meadows and rivers, or of the beautiful flora with which most of our country is garnished.

To note this growing interest in wild nature—and more especially when that interest is of an intelligent character, and not merely surface-deep—is distinctly encouraging to those who have devoted practically the whole of their spare time to a pleasurable and profitable study of wild life at home, and whose endeavours have, or should have, always been to inculcate and foster a love for nature amongst indifferent observers, and more especially to young and growing children.

Why am I a field naturalist? Those of my brother naturalists who may chance to read this unpretentious sketch will, I feel sure, appreciate my remark that the keen delights of being a worshipper and student at the shrine of nature, and the interesting and useful information which may be gained thereby, are so fascinating that to write down an absolutely faithful representation of one's thoughts and feelings is quite impossible!

But, having asked the question, I must perforce supply an answer, poor though the attempt at correctly portraying such may be.

I am a field naturalist because I am a staunch disciple in the belief that both mentally and physically one gains thereby, and to me the very fact of knowing something of what one sees and hears during a ramble in the country is of inestimable good, where the mere exercise of walking or feats of pedestrianism would alone be considered by many visitors to, and residents at, the countryside.

And it is not solely because of the fact that one knows the voice or flight of a bird; the colour and character of a flower or tree; the various nature-painted butterflies which toy upon the wing; the beetles which cross the path in the sunlight, some of them glittering like veritable jewels; there is more still in the fact that nature is inexhaustible: her treasures are so many, her store of wonders so vast, that the more one learns, the more there is to learn, and one is ever yearning for further information of these wild creatures and things, simply revelling in them and craving for knowledge—knowledge!

The field naturalist has no boundary-line; his field of observation knows no limit. He may roam the whole world over during the course of his studies, or he may simply devote his attention to the nearest lane or coppice, meadow or heath, lake or streamlet; even to the inhabitants of, and visitors to, his own little garden, or the nearest refuse-heap,—all are equally interesting, and have some wondrous story to unfold, and some life-story waiting to unravel.

To me the careful and intelligent study of our British wild life—to be in every sense of the term a true field naturalist, endeavouring to gain information and learn lessons therefrom—is one which everyone should pursue with pleasure and profit. Nature is so wonderful, her store of treasures so great, her workings so magnificent and awe-inspiring, that one should speak or write of her with reverence.

Prejudiced, I take it, most of us are with respect to the particular hobby or study in which we may be engaged; but, to my mind, it is a bounden duty for everyone possessing a degree of intelligence to learn something of the natural history of our beloved country, or at any rate to appreciate the same.

As to how to become a field naturalist, and more particularly as to how one became such, probably most of my fellows have most varied experiences to relate. Environment, taste, ability, enthusiasm, opportunity, education, determination, and perseverance are each important factors. But, not the least of these, is to have inculcated and nurtured a love for nature when the mind is young, when one first arrives at the understanding stage, and to be so taught that the interest at once takes an intelligent form rather than one of destruction.

We British are indeed a sporting nation. So soon as we can walk or run, the cricket bat is handled, the ball tossed in the air, the football is kicked, the fly thrown to lure the wary trout, the gun shouldered, the tennis racket skilfully manœuvred, the billiard cue deftly manipulated, the boat rowed; and one might enlarge. Yet it is an indisputable fact that in these days something beyond these is required for our quiet needs; we should aspire towards some ideal; some stimulant is necessary. Why not, then, take your staff in your hand, notebook in pocket, camera and field-glass, and go direct to nature, walk with her trustfully and well, scorning nothing, searching always for knowledge at her ever-flowing fountain?

This is an eventful age; life now is at such high tension that, unless quietly relieved, there is a severe danger of over-straining. Something is required to give relief. Why not, to obtain such, go to the great book of nature herself, unfolding slowly but surely each page of marvels and mysteries, rejecting nothing, but always maintaining a high standard of excellence and efficiency, and endeavouring to learn something, elementary though it may be, by a careful and steadfast perusal of nature's ever-open book?

Nothing is too insignificant in the study of natural history, no fact or record too trifling; a note jotted down on the spot is worth a cart-load of recollection.

Never shall I forget my cradle days with nature. Well do I remember, as if it was only yesterday, my first intelligent acquaintance with her treasures—that initial sight, in my tender years, of the delicate blue of the hedge-sparrow's eggs in its mossy homestead; the first indelible imprint will never be effaced from my memory. And I revere and cherish the memory of a grandfather now gone hence who first imbued within my young mind a love for nature study.

Folk-Lore—II.

By CHARLES MOSLEY.

THE WILL-O'-THE-WISP.

THE old order changeth, giving place to new, and the will-o'-the-wisp has had to yield up its haunts before the march of the contractor. What is now a populous neighbourhood, and a thriving suburb of a large manufacturing town in south-west Yorkshire, was once—and that not such a great long time ago—a dreary waste of swamp and bog. The name of Marsh, by which this neighbourhood is now known, doubtless owes its origin to the original character of the ground.

The heyday of the will-o'-the-wisp dates back to before my time, so that what I relate is from the accounts of those who knew this district in the state I have alluded to. The haunt which this mythical being mostly frequented was a patch of ground somewhat hollowed out and of more than normal dampness, containing a number of trees. Here amongst these trees did the will-o'-the-wisp enjoy its antics, to the fright and bewilderment of many who chanced to have occasion to pass that way. His time for appearing was in the "twilight," in the interim between day and night, when the fading light renders vision uncertain, and seems to lend additional charm to any mysterious circumstance.

The being which dwelt here is described as a "something" of shapeless form, with a certain luminosity, which danced and flickered about among the trees, and gave utterance to occasional crackling noises.

Such is the slender story of the will-o'-the-wisp, long since ousted from its stronghold, and now non-existent, save in the memory of the older inhabitants. Yet the weird history may perchance be of interest when "story-telling" is the order of the day, and the children's children seek from their grandparents a recital of their younger days.

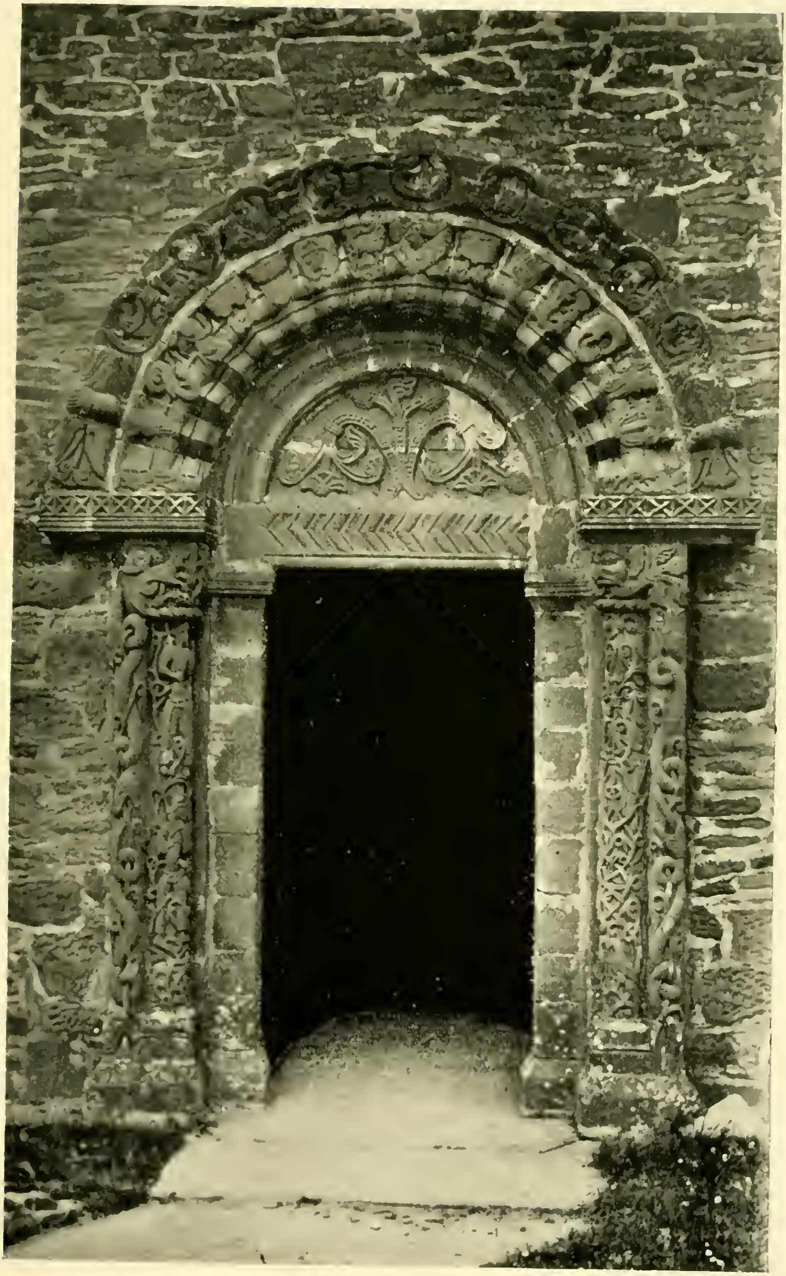
It seems unkind to take the romance out of the mystery, but the explanation of the will-o'-the-wisp is probably not far to seek.

When the evenings came on the atmosphere became cooler, the moisture rising from the damp ground would condense into a white mist, such as can be seen in any damp situation or low-lying piece of ground. It is this that I take to be the will-o'-the-wisp of which I have been told. Its movements of "flickering about" were probably caused by the wind waltzing the mist in clouds among the trees. The noises attributed to it I set down as extant only in the imagination — so far as their connection with the "being" is concerned.

Kilpeck Parish Church.

By Rev. P. J. Oliver Minos, Ph.D., M.R.A.S. (Lond.).

Kilpec, or Kilpeck, is a small parish and village in Herefordshire, noted for its ancient church dedicated to St. David (or rather St. Dewi) of Wales. The name Kilpec is a compound of Kil and Pedec, and signifies the cell or retreat of Badoc. Now Badoc is a corruption of the name Badawc or Madawc—a famous British saint; but the person



KILPECK PORCH.

after whom Kilpec is called was (I think) not the saint, for neither the cell, nor the church, nor the village, was at any time known as or associated with St. Badawc. Probably Kilpec was called after Badawc, a hermit, who went out from the neighbouring religious house of St. Dyfric[1] (L. Dubritius; Fr. Devereux). According to the well-known rule of construction in the Celtic tongues, the general descriptive word is placed first, the personal or specific word is placed after: thus Kilpeck, from B. *cil* = cell or retreat + Badoc (name), rightly illustrates its Celtic formation and origin. At this distant date the name Kilpeck speaks to us of the Celtic Church,[2] when the wilds of Wales, Northern England, and Scotland were dotted over with solitaries or hermits, whose fastings, vigils, prayers, and the courageous trust in God, made a powerful impression on the surrounding people; and who thus became the centres of evangelisation in their several neighbourhoods.

The church of St. David is a small but interesting edifice, owing to its many symbolical and grotesque carvings. Whether or not the present church stands on the original site of the Cell of Badoc, it is now impossible to say; however, I think, there are at least two relics of the Cell. Look at the church's west window! It is round-headed; the inner jambs are carved in beautiful and most intricate interlacings; the capitals are carved in the form of bloated human faces with strings of beads or pearls (incorrectly described as bridles) about the forehead and across the mouth; and the corbels decorated with very inferior interlacings. Now, the semicircular window heads would indicate Norman work; but, on minute examination and comparison, the interlacings on the jambs would prove to be so finished as to convey the impression of Celtic work.

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[1] St. Dyfric was the patronal saint, not founder, of the house. St. Devereux is now the name of both church and parish (or village that in course of time rose round the house).

[2] See *The Arts in Early England*, vol. ii., "Ecclesiastical Architecture in England from the Conversion of the Saxons to the Norman Conquest." By Professor G. Baldwin Brown, M.A. This second volume is entirely concerned with the architecture of English churches and the influence on them of Roman and Celtic types and methods.

Compare these with similar patterns on the grand south doorway: the difference in conception and execution is quite noticeable to an experienced eye. This window, I am inclined to think, formed (part or whole) the low entrance of the Cell of Badoc.[1] The Norman builder found the cell-doorway too low for the principal entrance into his church, and yet very handsome to be cast aside; therefore, he set it up as the west window, with additions.

Next, let us examine the small block of stone similar in shape to a Roman altar! At first, on observing the basin-shaped cavity on its upper end, we would say (as it has been said) it was a holy-water stoup. Was this stoup fixed or portable? If fixed, one face would be plain; but it is not so. If portable, the weight of the stone would be against it. Moreover, a portable holy-water stoup was not known. Let us examine the symbolical carvings on it: (*a*) clasped hands on the upper margin.[2] Surely this symbolises, "We receive this child into the congregation of Christ's flock"? (*b*) the serpent with four heads looking downwards at about the middle. This was pointed out to me as clearly referring to the use of holy-water. True, holy-water is used to exorcise; but, at the same time, the baptismal service says, "Renounce the devil and all his works," and "may have power and strength to have victory to triumph, against the devil," etc.[3] The four heads represent the cardinal points of the earth. Therefore, I conclude, that the said stone (now left standing in the chancel) is a (portable) font such as frequently used in chapels, oratories, cells, or missions; and it possibly may belong to the Cell of Badoc. The oratories or cells of the Celtic hermits were in several instances the beginnings of parish churches. The priest hermit celebrated the holy communion at the altar within the cell, and communicated his little flock at the door or entrance. But the rite of holy baptism was administered at the door of the cell in presence of all; on such occasions, a small font (such as the small font at Kilpeck) was used.

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[1] Usually about 5 feet or less high, *i.e.* just high enough to allow the hermit to enter in with bowed head, as is still the case in the East. See drawings of hermit's cell in old manuscripts. These dry stone beehive huts and oratories exist in fair numbers in Ireland, but of which we have practically no trace in England.

[2] Holy-water was never for brotherhood or union; hence the clasped hands cannot refer to the use of holy-water.

[3] The holy-water was originally the consecrated baptismal water reserved; and this reservation came afterwards to be made in a special vessel called the Stoup. Among Eastern Christians the consecrated baptism water is (to the present day) taken away in bottles to be reserved in homes. Holy-water stoups are not known among them.

Kilpeck parish church is mainly Norman work of the twelfth century, and this is evidenced by the elaborate chevron ornaments. It has been said to be partly Saxon work, on account of the stunted or deformed figures on the piers of the choir arch. I am not sure that this is a characteristic of Saxon work, for frequently on later works when crowding with ornaments and figures a very limited space, the figures are carved with very short legs[1] rather than cut them off entirely. I do not think the Saxons or Normans made a study of half or three-quarter figures; in fact, such figures were very rarely used by them. The first foundation of St. David's church is unknown.

Kilpeck parish church is of small dimensions, but elaborately ornamented both inside and outside at different periods by different hands. The ornamentations are mainly symbolical or allegorical. Let us begin studying the south doorway! This doorway is plainly late twelfth-century Norman work. The carvings on the edge of the semicircular doorway-arch are intended to represent animal creation; the large eyes inserted among the created things mean "God saw";[2] the harp represents "It was good."[3] The tympanum shows a hypothetical representation of the Tree of Life. On each doorpost is carved a tree (or rather two representations of one tree) to represent the Tree of Good and Evil. On the right-hand tree are to be seen doves, *i.e.* peace or concord, and a serpent climbing up to introduce discord. On the left doorpost the serpent is carved head downwards, *i.e.* climbing down after having finished his temptation; also, there are on this doorpost two human figures appearing one above the other—the top one a little on the background holding a cross is the regenerate or "new man," the lower one holding a club or sword is the natural man, or "Old Adam." Almost the whole face of this doorway is covered over with the Norman[1] intertwinings symbolising the in and out or intertwinings of good and evil in this world as seen by man. At a later period this idea of the mixture of good and evil is represented or caricatured under the eaves: there we notice a man bearing a cross (*i.e.* soldier of Christ), a man with eyes uplifted (*i.e.* devotion), a man with eyes drooping or closed (*i.e.* praying), a man with swollen cheeks and staring eyes (*i.e.* wine-bibber), a man with bloated face and sleepy eyes (*i.e.* glutton), etc. Each of these figures is quite a study, as it is more or less an index to the character portrayed.

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[1] The Chinese and the Hindus are still representing human figures with short legs for the same reason.

[2] Gen. i. 4, 10, 12, 18, 21, 25.

[3] *Ibid.*

Let us now enter the nave. Close by the south entrance we see a large font. This font filled the choir, and only recently removed to its present position. Even here it is too large. Its shape and size attracts inquiry. On examination, we shall find the bowl did not originally stand on the present pedestal, *i.e.* the bowl was intended to rest on a circular column, and not on an angular pedestal as at present (see the angular ends protruding under the bowl). The bowl itself does not look like a font, it is too shallow and too open-mouthed. It is more like a basin for ablutions, or like a fountain basin in the courtyard. Such fountains are to be seen in the courtyards of monasteries, priories, and mansions; in the East it is a very common outdoor vessel for weary and dusty travellers to quench their thirst, or cool and cleanse their faces, hands, and feet. Where, then, did this bowl come from? It may have come from the priory situated about a quarter of a mile from the castle; and the said priory was given by Hugh Fitz-William, an ancestor of the Lords Kilpec, to St. Peter's at Gloucester. Bishop Spofford of Hereford, in 1422, suppressed the priory.

Turning away from the font we look eastward. The choir arch stands before us. It is semicircular, with the well-known chevron ornament carved flat along the surface in different modes, presenting a pleasing sight of waves of light. This flat chevron is of earlier date than the ridge or open chevron; and it presents a better idea of waves of light than of light and shade. Notice the early attempts of trefoil (incorrectly called fleur-de-lis) on the imposts; also the tonsure on the hooded heads of the lowest figures on the shafts.

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[1] Most unusual ornament for Norman work; but, in this case, it is a copy of the Celtic work on the west window.

Next, we look at the sanctuary arch. It is semicircular and quite plain. Beyond it is the apsidal sanctuary with tiny round-headed windows. The chevron ornament is carved on the roof-ribs and over the heads of the windows. At the intersections of the roof-ribs are four faces looking towards four directions; and these are fierce-looking feline (maybe lions') faces, and they certainly cannot (as they are said to) symbolise the four Gospels. If they represent anything, I should say that they very incorrectly represent the four living creatures in Ezekiel i. 10. I am aware that the lion may stand for the Lion of Judah; but then the four faces would be the four aspects of the divine working. The zigzags would represent glory. Thus, in plain language, the ornaments carved on the roof of the sanctuary would represent Christ as the Lion of Judah in the midst of glory.

British Field Zoology.

By various Writers.

CHAPTER IV.—SPONGES.

By H. E. Forrest.

What is a sponge? The older naturalists thought it was a vegetable growth, and, even at the present day, to the lay mind, knowing only the sponge of commerce, this appears a very rational conclusion. Many naturalists too, unless they have studied the group, have an indistinct idea that sponges are intermediate between animals and vegetables. That a sponge is purely animal will be abundantly clear from the details which follow, though its exact position in the animal kingdom is not easy of determination, since it possesses features which are characteristic of the Protozoa on the one hand, and of the Metazoa on the other.

A living sponge consists of two parts—(1) a skeleton, which may be either fleshy, horny, siliceous, or calcareous; (2) a thin, transparent slime, covering the skeleton and lining all its cavities.

Sponges are classified in four main groups, according to the nature of the skeleton. The fleshy ones are a small and unimportant group; the horny ones include the sponge of commerce; the calcareous ones are of small size, but of great interest and beauty; the siliceous sponges are by far the largest group as regards number of genera and species. The Freshwater Sponge (*Spongilla fluviatilis*) belongs to this last group, and its structure and physiology may be taken as typical of the whole class.

To find Spongilla.—The field naturalist may seek for it in either brook, river, canal, or pool. I have found it in all situations, except in small stagnant ponds. It presents an extraordinary variety of aspects. In a large reservoir I once saw a huge colony, in the shape of stag's antlers, attached, 3 or 4 feet below the water surface, to the piles supporting a platform. Another large sponge formed a layer several square yards in area, coating the bottom of a streamlet below the sluice-gate of an artificial pool. To the naked eye the sponge patch is of a light yellowish-grey colour. A ready means of distinguishing *Spongilla* is by its odour. When just taken from the water it has a strong and not unpleasant smell, something like fresh sea-weed, but more pungent. Large specimens, however, such as those described above, are of no use for study. They die speedily, unless they have an unlimited supply of fresh water. Small specimens about the size of a pea are much more useful, as they can be placed under the microscope entire, and they will live for months in an aquarium. They can generally be found attached to the rootlets of trees in the water at the edges of pools, canals, and sluggish rivers, so that to procure them one has only to tear off a handful or two of the roots.

Place one of these little sponges, still attached to the rootlet, in a glass jar filled with water. At first there will be no visible sign of life about it, but if it be left undisturbed for a few hours and then examined with a pocket-lens, it will present an appearance somewhat like Fig. 17. Now watch it awhile. That curious transparent projection is a tube through which a current of water is issuing with a force that may be judged when I say that I have seen a good-sized *Volvox globator*, which came within "range," hurled instantly to the opposite side of the aquarium—a distance of nearly a foot!

Let us place the little sponge in a glass trough and examine it under a low power of the microscope, first adding to the water a small quantity of Prussian blue. The minute particles of colouring matter render the currents easily visible. Watch these; at certain points on the surface we shall see the particles *entering* into the sponge, sucked in by some invisible force; but no particles will be seen *leaving* the sponge except through the long transparent tube, but they issue thence in a continuous stream, and at much greater speed than they entered it.

The surface of the sponge bristles with sharp points, mostly arranged in little groups. These are the ends of the flinty needles (spicules), which by their aggregation constitute the skeleton of the sponge; they are entirely siliceous, but are held together by a horny cement. (In the sponge of commerce there are no spicules, and the skeleton consists solely of the horny cement.) In *Spongilla* these spicules are simple in form,—like needles slightly curved and pointed at both ends,—but in other genera they assume forms of endless variety, so that naturalists classify sponges in genera and species founded entirely on the form of the spicules found in each. Indeed, it is only in the skeletons (spicules) that sponges differ from one another; the living portion which clothes and forms the skeleton is practically the same in all genera. This is convenient in one way, for we need only study one type in order to understand the structure and physiology of the entire group.

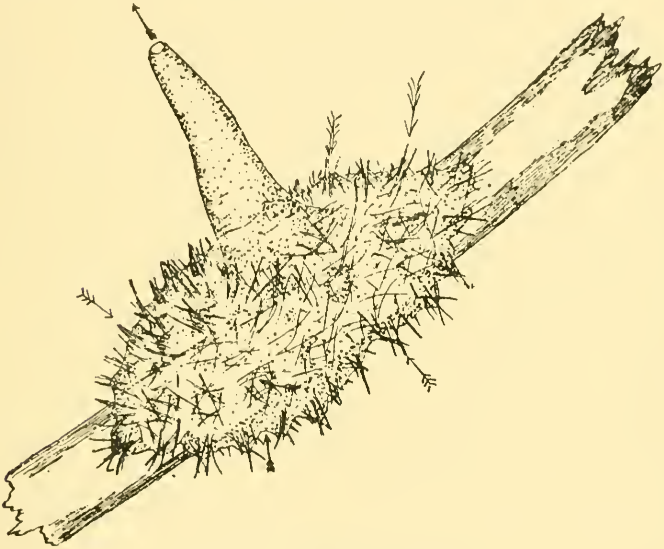


Fig. 17.—*Spongilla fluviatilis.*

To the naked eye the living mass of the sponge—considered apart from its skeleton—appears as a semi-transparent whitish jelly, and even in the microscope under a low power nothing more is to be seen. It is only by the use of reagents and very high-power objectives that all the details can be seen. The mass is then found to consist of three elements—(1) amœba-like cells; (2) collared cells; and (3) connective jelly. This last is merely a formless film, pervading and holding together not only the two kinds of cells, but the spicules and skeleton generally. The collared cells are found lining the cavities in the interior of the sponge. The amœboid cells are beneath them and distributed throughout the mass. In other words, the two kinds of cell are arranged in a certain definite order, one kind on the surface, the other kind beneath the surface. Those biologists who regard the sponges as Metazoa, look upon the arrangement of the cells as two distinct layers, which they style respectively the ectoderm and endoderm (= outer skin and inner skin).

It will perhaps be convenient here to make a little digression. We mentioned in Chapter II. that all animals originate from a single cell, the ovum, "which, after fertilisation, subdivides—becoming first a mass of cells, and then, by a more or less complicated series of changes, a separate individual." Now, however far apart in the scale the parents may be, the ova in all cases begin to develop in identically the same way. The single cell divides into two cells ; these divide, making four ; the four divide, making eight ; the eight, sixteen ; sixteen, thirty-two ; and so on. Very soon, however, the cells cease to be a mere bunch, and arrange themselves into two layers—ectoderm and endoderm. Eventually the different parts of the embryo (such, for instance, as the alimentary canal and the spinal column in the case of a vertebrate) are formed by the infolding of these two layers.

The reader will perceive from this that if we could demonstrate the existence of an ectoderm and endoderm in a sponge, we should be able without hesitation to place it amongst the Metazoa, because all these in their early stages possess these two germinal layers.

We are confronted, however, by a serious difficulty—the nature of the cells in sponges. The amœboid cells are similar in all respects to *Amœba* described in Chapter II., having a nucleus and contractile vesicle, and changing their position and shape by means of pseudopodia.

The collar-cells are highly characteristic, and merit careful study. The drawing (Fig. 18) will give an idea of their shape and appearance. Each consists of a mass of protoplasm, containing nucleus and contractile vesicle. The base is embedded in the jelly-like mass which connects all parts of the sponge together. The opposite end carries a long flagellum and a thin transparent cup-shaped collar. This appendage is not constant, it is merely a part of the protoplasm of the cell "spun out," and can be entirely withdrawn at will. In fact, it is never quiescent, for there is a continual slow interchange going on between the particles of the collar and the body of the cell. Particles of food brought by the currents caused by the flagellum adhere to the surface of the collar, sink into its substance, and are carried thus into the cell body. In fact, the process is exactly the same as in *Actinophrys* (Chapter III.), except that the radiating pseudopodia are here modified into a cup. I will even venture to say that functionally the pseudopodia and collar are identical.

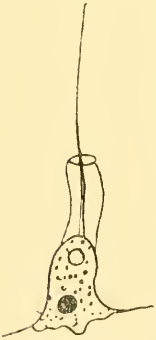


Fig. 18. — Collar-cell of sponge.

In Fig. 19 is shown *Monosiga*, a flagellate Infusorian, with a retractile collar, which in every detail closely resembles the sponge collar-cell.

Some authorities state that the two kinds of cell in the sponge are really only one—that they are interchangeable. A collar-cell will withdraw the collar and flagellum, become amœboid, and wander off in the under layers, whilst an amœboid cell may come to the surface and transform itself into a collar-cell. Whether this be so or not, one thing is certain: that both classes of sponge-cell are distinctly protozoic in character.

We will now examine the internal economy of the sponge and the arrangement of its component parts. In *Spongilla* these are rather complicated, so that it will be easier to understand if a diagram is given rather than an exact representation. Much detail is omitted, and the cells represented larger in proportion than they really are. The sponge is a mass of little tubes enlarged at intervals into rounded chambers. These chambers are lined with the collar-cells just described. The flagella of the collar-cells by their united action cause a strong current to flow along the canals and through the chambers. These currents always move in one direction, from the exterior inwards. The canals open into one another—the diameter increasing progressively—till they finally all empty into one big tube, through which the united currents issue in one strong stream, as shown in Fig. 20. It will be seen, then, that the cause of the current is to be found, not in the big exit-tube, but in the small tubes which empty their contents into it.

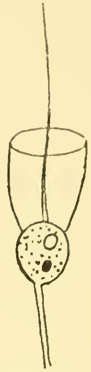


Fig. 19.—*Monosiga.*

The collar-cells take up food particles from the water as it passes over them. They feed, however, not only for their own good, but for the good of the whole colony; they also, regarded as a whole, elaborate the flinty spicules which stiffen the whole mass and form its skeleton.

Considered alone, each cell seems to be a Protozoon, but collectively, especially when we note the complex skeleton, we are driven to the conclusion that here is seen a degree of specialisation far beyond anything to be met with amongst the Protozoa.

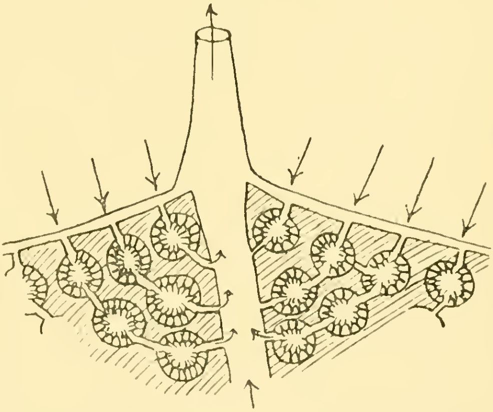


Fig. 20.—Diagram section of sponge showing chambers lined with collar-cells; also inhalant and exhalant apertures.

The difference becomes much more apparent when we come to consider the reproductive processes in sponges, for in them we meet with what are apparently true sex-cells, ova and spermatozoa. Both these elements are produced in the same way. The cells which line one of the chambers fuse into a mass, filling the whole chamber. They then, by repeated subdivision, break up into a cluster of smaller cells, ova or spermatozoa, according as the particular group is female or male. In all animals the female reproductive cells are comparatively large and few in number. The male cells, spermatozoa, are very small and numerous. The essential act of fertilisation consists in a single spermatozoon finding its way to an ovum, entering it, and becoming fused with it. In order to accomplish this the spermatozoa have to be capable of active locomotion. Each is therefore provided with a long whip-like flagellum, by means of which it propels itself through the water. The spermatozoa vary somewhat in shape, but only within narrow limits, so that, whether they are those of the highest vertebrate or the lowest cœlenterate, they more or less resemble in shape a tadpole with a small body and a long tail. Only a very few spermatozoa succeed in finding their way to an ovum, and this is evidently the reason that the male cells so far outnumber the female, as otherwise few of the latter would get fertilised. Nature is here profuse, but not wasteful.

In *Spongilla* towards the end of the year there are produced in the mass of the sponge a number of reproductive bodies called gemmules. They are about the size and shape of mustard seeds, and are of a very curious structure, having spherical flinty skeletons made up of spicules shaped like two wheels connected by an axle. Soon after these gemmules are produced the whole sponge dies, leaving them embedded within the dead skeleton, which gradually breaks up and liberates them. They lie dormant through the winter, but develop into fresh sponge colonies in the following year. The production of these gemmules seems to be peculiar to the freshwater sponges, whose conditions of life demand the winter "rest." Marine sponges have no such need, being functionally active from year's end to year's end.

Suburban Bird Life.

By R. W. Heenan.

Notes recorded within a few miles radius of Twickenham.

Missel-Thrush . .	Not uncommon at any time, and occurring in flocks in autumn.
Song-Thrush . . .	Common everywhere. Heard one singing at 2.55 a.m. on 22nd June.
Fieldfare	I have seen them near Hounslow and in Richmond Park in winter.
Redwing	Frequents the fields in winter in scattered flocks.
Blackbird . . .	Common.
Wheatear	Many in Richmond Park, where I saw one singing on the wing.
Winchat	Richmond Park.
Redstart . . .	Not uncommon in summer.

Redbreast	Common everywhere.
Nightingale	They sing in a copse below the Star and Garter Hotel, Richmond. Have heard one singing at 11.30 on Sunday morning.
White-Throat	Fairly common. Arrived this year on 22nd April.
Blackcap	We do not see many of these birds. Noticed one feeding on ivy berries in early spring.
Chiffchaff	Not uncommon. Saw the first on 28th March.
Willow-Wren	Generally hear it singing near the river Thames.
Wood-Wren	Richmond Park.
Sedge-Warbler	See them and hear them singing along the river Crane in spring.
Hedge-Sparrow	Common.
Long-Tailed Tit	See small parties in winter. On 3rd August I saw a flock of these birds with Great- and Blue-Tits.
Coal-Tit	Not uncommon.
Great-Tit	Fairly common. Heard one singing on 19th January.
Marsh-Tit	Uncommon.
Blue-Tit	Common. A pair nest every year in our garden.
Nuthatch	Not uncommon in wooded parts.
Wren	Common.
Tree-Creeper	Not so common as the Nuthatch.
Pied Wagtail	Common. With us all the year round.
Grey Wagtail	I see this bird by the river Crane in autumn and spring.
Yellow Wagtail	In summer.
Meadow-Pipit	In Richmond Park.
Red-Backed Shrike	In summer always notice it by the railway line above Twickenham.
Spotted Flycatcher	Fairly common in summer.
Swallow	Common. In summer hundreds always flying over the Thames.
House-Martin	Common. Were feeding young in nest in Staines Road, Twickenham, on 5th October 1902.
Sand-Martin	Common by the Thames.
Greenfinch	Common. I saw a Greenfinch singing on the wing on 3rd May of this year.
Goldfinch	Saw one near Hounslow Powder Mills on 1st December 1901.
Siskin	Saw two in November at St. Margaret's.
Redpoll	Seen in winter occasionally.
House-Sparrow	Very common everywhere.
Chaffinch	Common.
Linnet	Fairly common, large flocks in winter.
Bullfinch	Not common.
Corn-Bunting	Heard its peculiar song occasionally.

Yellow Hammer	Not common.
Reed Bunting	By the river Crane.
Starling	Common. In winter enormous flocks roost in small plantation on Wimbledon Common.
Rook	Common. In winter all the Rooks round here seem to roost in a wood in Richmond Park; they fly there from all parts in company with Jackdaws.
Jackdaw	Common. Generally in company with Rooks.
Carrion Crow	Not uncommon. A pair that breed opposite Ham House have a habit of settling on the river after the manner of Gulls.
Jay	Uncommon. Have seen them in Richmond Park and near Fulwell.
Skylark	Common. Have heard them singing almost all the year round.
Swift	Many in summer. They stayed this year until the end of August.
Nightjar	Common in Richmond Park. Have heard them utter, besides their "churring," two different notes like "qu-ick" and a vibrating "squeak."
Lesser Spotted Woodpecker	Not common, but occasionally I hear it "drumming."
Green Woodpecker	Common. "Laughs" all the year round.
Kingfisher	Common by river Crane, and I have seen it on the Thames.
Cuckoo	Hear a great many in the spring.
Wood or Brown Owl	Not uncommon. Fly over our garden and call "Kee-wick."
Barn Owl	Have seen them occasionally.
Kestrel	Has been common from October to April during the last two years.
Heron	Fairly common. They nest in the woods in Richmond Park.
Mute Swan	Many on the river Thames.
Mallard	Common in winter; a few pairs breed near here.
Wood-Pigeon	Common. Enormous flocks in winter.
Turtle-Dove	In summer we see a few.
Pheasant	Common in some parts.
Partridge	Have seen coveys quite close to Twickenham Station.
Moorhen	Common on almost every piece of water.
Coot	Not quite so common as the former.
Lapwing	Large "wings" of Lapwings frequent the fields in the winter months. Arrive about the third week in September, and leave us at the end of March; although a few pairs breed near Staines and at Sunbury.

Common Snipe . .	See a few every winter.
Blackheaded Gull .	Large flocks of these gulls frequent the Thames and fields round here in the winter, and have seen them occasionally in summer.
Herring-Gull . . .	A few occasionally among the Blackheaded Gulls.
Great Crested Grebe	A pair have bred on the Penn Ponds, Richmond Park, the last few years. I saw this year three young swimming about with their parents.
Little Grebe . . .	Not uncommon.

The Field Naturalist's Library.

REVIEWS OF BOOKS, PERIODICALS, ETC.

FOLLOWING THE DEER. By W. Long. London: Ginn & Co. Price 4s. 6d. net.

With the publication of his *School of the Woods*, and the article from that work on "How the Animals Die," in the *Field Naturalist's Quarterly*, Mr. Long secured for himself a large audience on this side of the Atlantic. Hence this handsome volume recently sent out by Messrs. Ginn will be readily welcomed. It is on the same lines as his former works, and teems with the first-hand observations of a man who has looked carefully before he writes. This is Mr. Long's great charm: we see him at work, and hear him thinking as he goes. The spirit of the book is that of the following sentence:—"The most wonderful lesson of all that year's hunting was that an animal's life is vastly more interesting than his death, and that of all the joys of the chase the least is the mere killing." The beauty of style in which the publishers have issued these books of Mr. Long's makes one wonder when it will be possible to have British books of this kind sent out with the same finish. They are a pleasure to the eye, as well as a charm to the mind.

MOSTLY MAMMALS. By R. Lydekker. London: Hutchinson & Co. Price 12s. 6d.

The series of zoological essays which are here collected into book form have appeared for the most part in our contemporary, *Knowledge*, some of them in *Nature*, *The Field*, and *The Asian*. The author is too well known as a zoological writer for us to do more than draw attention to the publication of this volume, which would make an admirable Christmas present to any lover of mammalian literature.

The contents of the volume are wide and varied in the subject-matter. Animal colouration in different phases has a good deal of space devoted to it; and the monkeys of Africa figure prominently. Two very interesting chapters are those on the Pedigrees of the Cat and the Dog; while to many of our readers the chapters on the Wild Ox, Wild Cattle of the Phillipines, and Sheep will be specially attractive.

The sixteen full-page illustrations are by the Duchess of Bedford, Lord Delamere, Hon. Walter Rothschild, J. Wolf, etc. By the courtesy of the publishers, we are enabled to produce one of these, which forms the frontispiece of the book, showing the head and fore-limbs of the aye-aye of Madagascar. The extraordinary features of this creature are well shown, and it is easy to see that its former name (*Sciurus*) was not without significance, for it is very squirrel-like in some characters. But the most striking point about it is the very curious third digit of the hand, which is very thin and elongated. As in other lemurs, the thumb is opposable, and has a flat nail. The other digits have claws, as have the toes, with the exception of the big toe, which is flat-nailed like the thumb. The teeth of the aye-aye are shaped like those of rodents, and there are no canines. There is a single pair of incisors in each jaw. The name—Aye-aye—is a cry of surprise of the inhabitants of Madagascar, so it is said by Sonnerat, who discovered this animal. Its habits are nocturnal and arboreal.

THE NATURAL HISTORY OF ANIMALS. By Professor J. R. Ainsworth Davis. London : Gresham Publishing Co. Half-vols. iii. and iv. Price 7s. each.

The third and fourth half-volumes of this series are now to hand, and Professor Davis, having completed the purely morphological part of his task, as well as the systematic portion, comes to the—from the field naturalist point of view—more interesting questions which are concerned with the how and the why of animal existence.

Volume ii. deals with "The Food of Animals," the means by which animals obtain the necessary materials wherewith to build up and repair the tissues of their bodies. The flesh-eating, plant-eating, and omnivorous animals are considered successively, with special reference to the manner in which they are modified as the result of their special proclivities in the matter of food. Following this, a number of the devices and structural modifications which enable animals to escape from those predaceous forms which have developed a gastronomic liking for them, are described.

Professor Davis is here at his best, and it is at this part of his task, if we mistake not, that his work will attract the greatest attention and interest from his readers. We are not aware that the subject has been treated quite in the same way before ; but we are sure that it is a good way, and one that will appeal to students of animal life.

In the group of flesh-eating mammals a large number of typical mammals are discussed from the food standpoint, beginning with the cat family and ending with the Cetacea. In the former, the feet, the teeth, the skull, the protective colouration, and special habits, are all dealt with, and their interdependence shown. In the latter, the whole group, the manner in which these mammals have been specialised for aquatic life, the structural adaptations in body, tail, and limbs, as well as in teeth, lungs, and skin, all are simply and clearly explained, and well illustrated.

SCENTING DANGER.

The rest of the volume deals in a similar manner with the insect-eating mammals, carnivorous birds, insect-eating birds, carnivorous and insectivorous reptiles, amphibians, and fishes, worms and molluscs, carnivorous insects, spiders, crustaceans, starfish, sponges, and finally the Protozoa. Then we are taken again to the highest mammals which feed upon plants, and once more trace the plant-feeding animals down the scale through each class. Lastly, in the volume, the omnivorous animals are dealt with in similar order.

It will be seen that the scope of this volume is that of one of the most interesting of the phases of animal life: and Professor Davis has used the opportunity well. We note that the author includes birds and small mammals in the dietary of the English grass snake (*T. natrix*), in spite of the fact that some very high authorities would restrict its diet to amphibians and fish. In this Professor Davis has our support, though we should like to know his evidence. We have recorded the finding of birds in the gullet of this species, and quite recently a mole was similarly found. Nor could we ever understand the partiality exhibited by this snake for tree-climbing, except on the supposition that it was after small birds. The British adder is given the old specific name of *Pelias berus*: it would have been better to use the more accurate one of *Vipera berus*.

Space forbids our following Professor Davis through this interesting volume; but the above résumé of its contents will show our readers that it will well repay perusal, and give the field naturalist just the kind of information which he specially wants.

Volume iv. concerns itself with another aspect of animal life, namely, "Animal Defences," and here again we are of opinion that the subject is dealt with admirably and freshly. The numerous protective devices which enable animals to evade or escape from the attacks of more powerful forms, constitute one of the most fascinating pages of natural history, throwing light on the great principle of the survival of the fittest and the corresponding elimination of the least fit. Professor Davis well says that "it is impossible to avoid language which seems to attribute conscious effort or knowledge on the part of this or that animal; but under a great many of the headings employed, such as 'precautionary measures' and 'passive defence,' the defence is of purely unconscious kind, and has been determined by evolutionary factors, working irrespective of the will or knowledge of the animal." The animal defences are classified under the heads of precautionary measures, resistance, and retreat. Under the first head come bodily characteristics, as far as they result in inconspicuousness or the contrary; and, secondly, the mode of life, *i.e.* the feeding at favourable times and in favourable places. Resistance takes the form of passive defence by means of bodily characters, such as unpalatability, possession of armour, special instincts (as death-feigning), or unusual fecundity. Also, there is active defence by means of aggressive weapons, defensive weapons, and the use of the practice of co-operation. The use of retreat involves the habits of animals in movements, burrowing, flight, and so forth. The mere enumeration of these will serve to indicate the interesting nature of this volume, and we trust that it will find a ready welcome at the hands of the field naturalist public. In our opinion, it is the best of the four already issued.

ANIMAL LIFE AND THE WORLD OF NATURE. Vol. i. London: Hutchinson & Co. Price 10s. 6d.

This handsome volume is the first volume of Messrs. Hutchinson's journal, *Animal Life*, and, with the 718 illustrations it contains, will doubtless be a delight to a large number of young folks, to whom it would be a welcome present. With such contributors as Lord Avebury, Sir Harry Johnston, Sir Herbert Maxwell, R. Lydekker, W. H. Hudson, W. Saville-Kent, and others, it goes without saying that there is much good matter in the volume. There is a good deal, however, which can hardly be called natural history, but which is more amusing than instructive. While many of the illustrations are excellent, notably those by Mr. Reid of Wishaw, there are too many of what look like caricatures of the natural animal, and, personally, we prefer to see an elephant shown on its four legs than on its two hind ones. The excellent photograph of the family group of slow-worms on p. 339 is evidently one of those referred to by the Rev. Cornish Watkins in this Journal (vol. i. p. 289). It is a pity, however, that Mr. Watkins did not give the evidence for his suspicion that "old blind-worms may, with justice, be suspected of cannibalistic tendencies." The point is a new one to us, and of interest. With so much that is good in the volume, both of letterpress and illustration, it is rather a pity that the standard of both is not more uniform. But this, perhaps, is more than can be expected in a journal which covers such a variety of subjects and with such a number of contributors.

AGRICULTURE FOR BEGINNERS. By Burkett, Stevens, and Hill. London: Ginn & Co. Price 3s. 6d.

The authors of this little book believe that there is no line of separation between the science of agriculture and the practical art of agriculture. They are assured by experience that agriculture is eminently a teachable subject, and that its theory and practice can be taught at one and the same time. The fundamental principles of farming can be taught to a child just as the fundamental truths of arithmetic or grammar; and a youth should be trained for the farm just as he is trained for any other occupation. This training must begin in the schools, because it is there that tastes are acquired and aptitudes developed; and, moreover, most boys and girls reared on farms get no other training than that of their schooldays. The book deals in a very readable manner with Soil, The Plant, How to Raise a Fruit Tree, Diseases of Plants, Insects, Farm Crops, Domestic Animals, Dairying, and other farm matters. It is profusely illustrated, and an excellent work for those engaged in teaching in rural schools, as well as for the scholars.

AN INTRODUCTION TO NATURE STUDY. By Ernest Stenhouse, B.Sc. London: Macmillan & Co. Price 5s.

"One of the most encouraging of recent educational movements is the increasing importance attached, both in this country and abroad, to what is called Nature Study. . . . The aim of Nature Study . . . is not primarily the acquisition of the facts of natural history; it is rather a training in the methods of open-eyed, close, and accurate observation, especially of familiar animals and plants, which shall teach the student to *see* what he looks at, and to *think about* what he sees."

This book has been written in the spirit of the above sentences quoted from the preface. Part I. deals with Plant Life—seeds, how a green plant feeds, the forms and duties of leaves, buds and twigs, how stems do their work, some common flowers, grasses, common forest trees, fruits and seed dissemination, ferns and horsetails, and, lastly, mosses, mushrooms, and moulds. Part II. takes up Animal Life. The subjects include a sketch of the rabbit as a typical mammal, how a rabbit lives, some other mammals (as the cat, dog, and sheep), the pigeon as a typical bird, the development and education of the chick, some familiar British birds, frogs and tadpoles, the habits and life-histories of common insects, some crustaceans, mollusca, and worms; and, finally, a chapter on Field-Work, with a monthly nature calendar.

The book is a valuable one from its own standpoint, and one which we recommend to those engaged in nature-study work. The short chapter on Field-Work is excellent, and if we had space we would quote it *in extenso*. We can, however, only advise our readers to take Mr. Stenhouse's advice, and make a large map of the district they work in, and record upon this the positions of all features of special local interest, duplicating the map for flowers, trees, animals, archæology, geology, and so forth. The idea is a capital one, and the result could not fail to be instructive and useful.

A TREATISE ON ZOOLOGY. Edited by E. Ray Lancaster, F.R.S. Part I. Introduction and Protozoa. London: A. & C. Black. Price 15s. net.

This admirable volume comes at a time which is opportune for many of our readers whose attention has been drawn to the Protozoa by Mr. Forrest's articles on this group in our series on "British Field Zoology." Those articles have had the effect of determining some field naturalists to take up this part of zoology as a study, and they now want a text-book which will take them much farther than it is the object of this Journal to do. To these readers, and to others who are already interested in the Protozoa, this book will be a great boon, and we advise them to become possessed of it.

This Part I. is written by Professors J. B. Farmer, E. A. Minchin, S. J. Hickson, and Mr. J. J. Lister, and the mere enunciation of these names is sufficient to guarantee the excellency of the matter. Each of them has written on his special subject, Dr. Lister on the Foraminifera, Professor Hickson of the Infusoria, and Professor Farmer on Protozoan cell structure.

The volume is liberally and excellently illustrated; and while the extent of matter included makes it impossible to even sketch the whole contents further, we may say that we have been specially attracted by the parts which deal with the Coccidia, the life-histories of the Sporozoa (including the malarial parasites), and the description of the reproduction of the Infusorians. But the whole work is so full of interest, that it is hardly fair to specify particular portions. Every earnest student of the Protozoa will wish to have and study this volume.

THE NATURALIST IN LA PLATA. By W. H. Hudson, F.Z.S. London: Dent. Price 5s. net.

The fact that this is the fourth edition of a book first published in 1892, in itself speaks for the popularity the work has attained. The present edition is a cheaper edition than its predecessors, but it has not been allowed to suffer in the matter of excellence of print and general appearance. The letterpress and the drawings in the text have been left as they were; the only change is in the form of the book, and the substitution of new plates, one of which we are able to reproduce, for the old ones.

Mr. Hudson's plan has been to sift and arrange the facts he has gathered concerning the habits of the animals best known to him, preserving only that which was best worth recording. Many different subjects have linked themselves together under few headings, so that the scope of the book is not indicated by its list of contents, but a good index has supplied the necessary headings.

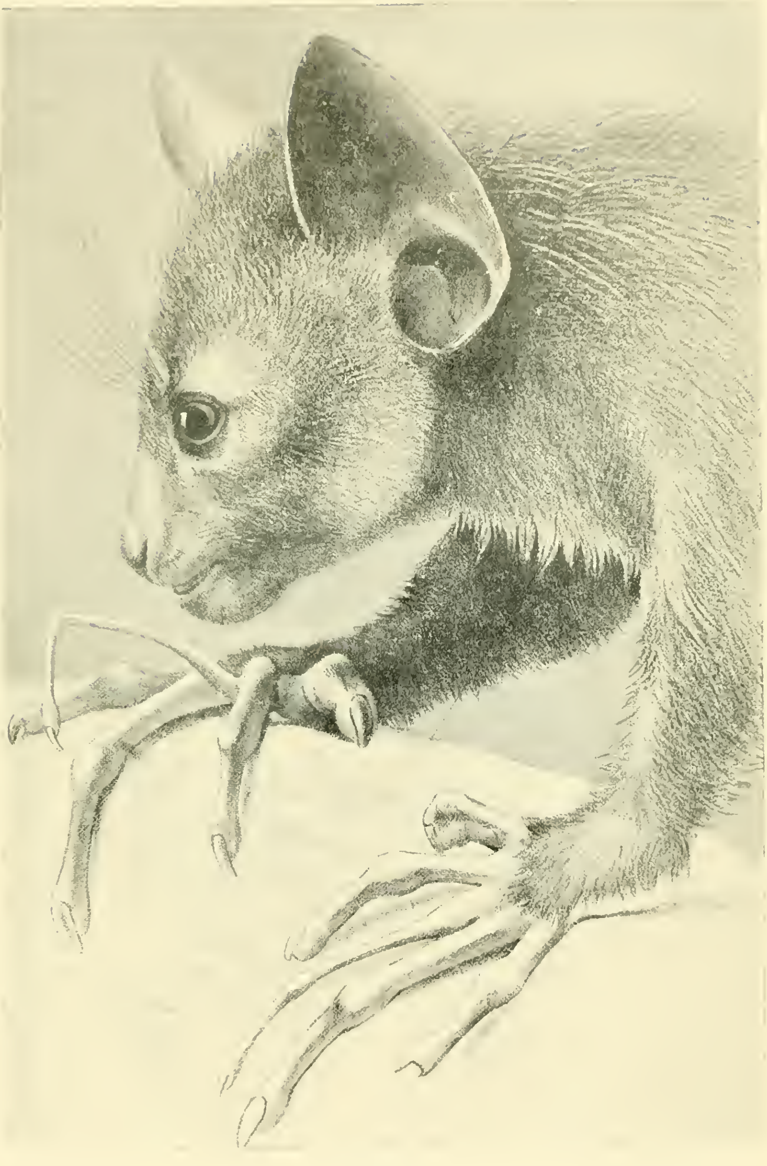
A most interesting chapter is that on Parental and Early Instincts. The young bats of the common Buenos Ayrean species are attached to the mother after birth, although they are only a third less in size than herself, so that she carries a weight exceeding that of her own body. The young bat does not change its position, or move, like the young opossum, until mature enough to live an independent life. If forcibly separated from the mother, they cannot fly at this early stage, but flutter to the ground. They are practically, for the time, parasites. This habit of this bat gives Mr. Hudson the opportunity of making some remarks about the young of other mammals, which are of great interest.

Another section of great interest is that on Mosquitoes and Parasite Problems; also that on Nature's Night Lights, and the chapter on Music and Dancing in Nature. This latter subject, that of the combination of animals to take part in amusements, is a very fascinating field of investigation.

We cordially recommend our readers to buy this book, which is worth reading from cover to cover.

A CLASS-BOOK OF BOTANY. By G. P. Mudge, F.L.S., and A. J. Maslen, F.L.S. London: Arnold. Price 7s. 6d.

This book, which appears under the severest title, should be in the hands of teachers and students alike, to be read with considerable pleasure



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on account of the concise and pleasant way in which the usually dry facts of Botany are put before the reader. The authors' idea has been to produce a "single work that shall fully deal with the requirements" of all students preparing for examinations in the subject for the London University and Board of Education ; and they have succeeded in producing a book which cannot fail to be invaluable to every student of Botany.

The bulk of the work is given up to the description of certain "types" of phanerogams and cryptogams, in which the morphology and physiology of each type is carefully explained to the minutest detail. There are several chapters on the Special Morphology and Classification of Angiosperms, and two chapters devoted to Physiology are even more absorbing than the foregoing chapters, with definite instructions for some simple and necessary experiments in the functions of plant life.

It is also very refreshing to see quite new illustrations, not the same old diagrams, good as they are, which have confronted us for years in Botany class-books. But, considering the excellence of the letterpress, the illustrations might have been very much better than they are. The drawings of sections are very good, but some of the other illustrations are not worthy of the rest of the book. To take one example, perhaps the most defective, the representation of a whole plant of Pellia (on p. 230) is poor, and gives one the impression that a starved, miserable specimen was drawn from, if indeed it was drawn from nature at all. We quite expect to hear of this class-book being received with gratitude by teachers especially, and recommended to all students of Botany, who ought to spend delightful hours in its perusal.

Messrs. Ginn & Co. announce a new book by Wm. T. Long, entitled *A Little Brother to the Bear*, which is illustrated by Charles Copeland. The little brother is the "coon." Messrs. Cassell have just issued *Wild Nature's Ways*, by R. Kearton. Both of these books are admirably adapted for gift-books at Christmas.

Field Clubs and Societies.

AT the usual monthly meeting of the Vale of Derwent Naturalists' Field Club, held on 6th November, a paper was read on "The Value and Use of a Study of Nature," by the president, Mr. H. F. Bulman. It was pointed out at the beginning that the chief object of the club was to encourage the study of natural history in the field and first hand, and not merely from books. The pursuit of nature in this way was health-giving, and tended to that most desirable ideal, "a sound mind in a sound body" by taking its votaries into the fresh air of the country, and thus giving not only exercise for the body, but training for some of the most valuable faculties of the mind, such as observation and reflection. To the child of nature with a seeing eye and an understanding mind, every bank and hedgerow, every pond and stream, every tree and flower, every mine and exposed cliff, was full of wonder and interest.

The late Mr. Frank Buckland, the Rev. Hugh Macmillan, Ruskin, and other eminent authorities were quoted in support of the importance of correct observation, and as being superior to mere book-learning. It was shown that nature was a fruitful source of idea and suggestion to architects, engineers, painters, wood-carvers, etc., and that bees, ants, and other insects taught many good lessons in design. The forces of nature—heat, electricity, gas, etc.—opened their secrets to the inquiring mind of the engineer, who put them, to some extent, under control for the benefit of men. The writer, in conclusion, quoted from Canon Liddon: "Everywhere around you are evidences of the existence and movement of a mysterious power, which you can neither see nor touch, nor define, nor measure, nor understand. This power lives speechless, voiceless, unseen, yet energetic in every bough above your head, and in every blade of grass beneath your feet."

Two valuable cases of beetles of the Derwent Valley were shown by Mr. R. S. Bagnall of Winlaton, which, with a collection of pressed wild flowers, shown by Mr. Bulman, added very much to the interest of the meeting. The secretary announced that he had succeeded in arranging for a lecture or paper on various subjects in natural history for every meeting during the winter. The next lecture, on "Milk, and the Feeding of Children," will be given by Mr. G. Ord on 5th December. Four new members were elected. The Rev. A. G. Baldwin moved, and Mr. W. Houghan seconded, a vote of thanks to Mr. Bulman for his valuable paper, which was enthusiastically carried.

The same field club has issued vol. iv. of *Notes on the History, Ornithology, Entomology, and Botany of the Vale of Derwent.* This volume contains a selection of the papers read before the members, and contains, in addition to much interesting matter, some excellent illustrations. The club is now sixteen years old, and is doing excellent work.

We have received the *Transactions* of the Hull Scientific and Field Naturalists' Club for the year 1903 (vol. iii. No. 1), edited by Thomas Sheppard, F.G.S. Included in this volume is Mr. Wade's paper on the "Birds of Bempton Cliffs," to which we drew attention in our last issue. A vast amount of other local work is also dealt with, amongst which may be mentioned contributions on "The Marine Fauna of the Humber District and the Holderness Coast," by T. Petch, B.Sc.; "Evidences relating to East Hull," by Thomas Blashill, F.R.I.B.A.; "Addenda to the Flora of the East Riding," by J. F. Robinson; "Dispersal of Shells by Beetles," by Rev. E. P. Blackburn; "A Preliminary List of Lepidoptera occurring within eight miles of Hull," by J. W. Boult; "Third List of Yorkshire Coleoptera," by T. Stainforth and H. E. Johnson; "Additions to the Diatomaceæ of Hull District," by R. H. Philip; and various shorter notes.

The illustrations to the volume are numerous and well reproduced. The secretary's report states that in no previous part of the club's history has it accomplished so much as in the past year, a very satisfactory matter (1901–1902). In 1902–1903 no less than twenty-five lectures were given, a large proportion being on local investigations of science, which is as it should be. In addition to these, the number of excursions was considerable. The total list of members now stands at 177. We are glad to see that the secretary is able to report a good sale of the club's publications; they are of such high merit that there ought to be a demand for them amongst the scientific public.

Correspondence.

Immunity.—"Your recent article upon 'Immunity,' with special reference to the mongoose, interested me much, because, though I had long read about the matter, I confess the exact meaning of the term was by no means clear in my mind. My object in writing now, however, is to ask if you could not give more of your space to questions of this sort, which have a wider significance than articles on special localities. I could enumerate many such topics which I feel certain my fellow field naturalists would be glad to see similarly dealt with, but it will be sufficient if I state one or two. There is great need for articles on similar lines dealing with Telegony, Maternal Impressions, Heredity, the Transmission of Acquired Characters from Parents to Offspring, and Variation in Animals. All these questions are much in the air, but it is astonishing how difficult it is for a non-professional biologist to obtain a clear understanding of the most recent work thereon, owing to the very highly technical character of the original papers. I trust I may be forgiven the suggestion."—"INTERESTED ONLOOKER."

[Our correspondent need not apologise. We are always glad to know what our readers want, and if possible to supply it. We quite agree with his suggestion, but would point out to him that Telegony was dealt with in our first issue, and that we have already intimated that articles upon Heredity, Acquired Characters, and Maternal Impressions are in course of preparation. In the meantime, we would advise our correspondent to obtain the numbers of *The Lancet* (August and September, etc.), in which a keen correspondence on Acquired Characters has been raging, and he might further read Dr. Archdall Reid's book on *Alcoholism: A Study in Heredity*, with much profit. He will have no difficulty in following the reasoning in that work.—ED. *F. N. Q.*]

Natural Attitude of Puffins.—"On looking through some back numbers of the *Zoologist* I came across some very interesting remarks on this subject by Mr. O. V. Aplin in his article, 'Further Notes from Lleyn' (vol. v. 1901, pp. 147, 148). He sums up his observations thus: 'It is possible that if puffins are seen which seem to be for the moment resting on the tarsus, they are birds which have paused in the act of raising themselves from a recumbent position. . . . But the puffin undoubtedly walks and stands on its feet alone, and not on its feet and tarsi like a guillemot.' There is also this further interesting footnote on p. 147: 'Although photography has made known the real attitude of the puffins on land, very little notice has been taken of the erroneous way in which it has been represented. The puffin is wrongly represented in Yarrell; Wood's *Natural History*; Morris's *British Birds*; Bewick; Mudie's *Feathered Tribes*; Gould's *Birds of Europe*; Booth's *Rough Notes*; and *British Birds, their Nests and Eggs* (1898). It is correctly delineated in Lord Lilford's plate, and in Willoughby's *Ornithology*, the puffin is figured with the tarsi off the ground.'"—H. HOLYROYD MILLS, Camborne, Cornwall.

Smooth Snake in Dorset.—"On 16th July I caught a smooth snake alive close to a spot where I had previously taken one. For a time it took no food, but then fed on two occasions, at one time taking a lizard, and at another time a slow-worm about 7 inches long. Over this latter morsel the smooth snake took three-quarters of an hour, spending about half that time with three coils tightly fixed round the slow-worm."—M. KERR, Dorchester.

Adders' Enemies.—"I notice in *British Serpents* an allusion to the opinion that pigs eat adders. I may say that in 1857 in a department of France, a viper's nest was found in a field of truffles. The people thereupon introduced a lot of pigs. The pigs cleared away the vipers, but then took to eating the truffles. The number of vipers caught in that department in ten years amounted to very many thousands.

"A grouse-keeper in South Northumberland, near Haltwhistle, told me some years ago that the goats (half wild) cleared the vipers away. He added that he had seen scores of vipers' heads, which he could not explain until one day he saw a goat approach a sleeping viper, and catching it by the neck with its cloven fore-foot, began to eat it, commencing with the tail. Coming to the head the goat ceased the process, hence the explanation of the number of vipers' heads which he had so often seen."—A. S. FARRAR, D.D., F.G.S., F.R.A.S., Durham University.

Information on Bats wanted.—"I should be glad if readers of the *F. N. Q.* would furnish me with particulars of the bats of their respective districts. As far as possible I should like the information classified as follows:—(1) Name of species; (2) rate of occurrences (common, rare, local, or general); (3) method of flight (high, low, flickering, skippish, laboured, swift, etc.); (4) period when on the wing; (5) nature of locality frequented in flight (open country, in woods, etc.); (6) the favourite roosting situation; (7) position when at rest; (8) food; (9) colour in particular area under notice (with a view of ascertaining the existence or otherwise of local variations); (10) any freaks or varieties known to have occurred; (11) any other information.

"The name and address of the observer must be stated, as also the locality in which the observations were made. I shall be glad to identify any species sent me for the purpose, but I do not desire them to be shot or hurt in any way. It is the observing of the *living* creatures that I emphasise, and do not countenance the killing of these useful little animals."—CHARLES MOSLEY, 20 Moor End Road, Lockwood, Huddersfield.

Walton Cross.—"I enclose a photograph of Walton Cross, an old relic situated about six miles from Huddersfield. I am unable to learn anything of its history, but possibly some reader of the *F. N. Q.* may be in a position to enlighten me."—CHARLES MOSLEY, 20 Moor End Road, Lockwood, Huddersfield.

Magpies.—"All poultry-keepers in this neighbourhood have suffered much this year from the disappearance of chickens. The experienced in this matter tell us that it is a magpie (one or more) that commits the depredation, and one neighbour informs me that a gallina chicken was taken by a magpie before his eyes within four or five yards from the back door. The loss has been really serious, no brood wandering with the hen-mother seems to be safe. I am told by a gamekeeper near that he has shot many magpies this summer. In the only book of reference upon the subject that I possess nothing is said of this propensity further than 'nothing comes amiss to it, but eggs and carrion are preferred.' Probably more readers than myself would like some information on this habit."—J. L., near Hereford.

[Like all the indigenous members of the crow tribe or Corvidæ, the magpie is almost omnivorous. Although the most conspicuous and most attractive of the family, it is unfortunately true that the magpie is an abandoned poacher, having a decided fondness for young birds, as well as eggs and carrion. The late Lord Lilford observed a magpie feeding on a dead donkey, an unusual sight from both points of view. But, nevertheless, the staple food of this bird is probably worms, slugs, and snails. Muirhead, in his *Birds of Berwickshire*, says, "that the gamekeeper has practically exterminated the jay and the magpie in parts of the north," but in the woods of Herefordshire the magpies are in great numbers.—ED. *F. N. Q.*]

Rutland Birds.—"In my notes on *Rutland Birds*, by Mr. R. Haines, M.B.O.U., *re* the nightingale, I inadvertently quoted from the author's article 'two pairs in the immediate neighbourhood of Uppingham,' instead of 'one hundred pairs,' which words appeared in the original article. Kindly allow space for this correction.

"Respecting your footnote, I would say that all readers of the *F. N. Q.* will, I think, admit the high excellence and interesting character of the articles therein contained. If *all* magazines dealing with Natural Science were equal to this, my remarks would not have been justified. Unfortunately, however, I have before me a recent number of one of the most authoritative magazines devoted to Natural History, in which a correspondent seriously states that two species of British gulls (*Larus*) habitually lay eggs in each other's nests, though the astounding statement is unsupported by any evidence. Some day the study of Natural History may be 'an exact science,' to-day one cannot say that it is."—W. GYNGELL, Scarborough.

[We are glad to insert the above correction and note, but would point out to our correspondent that he was criticising an article in the

F. N. Q. which he distinctly placed on a par with other articles referred to. In our opinion that criticism was not justified, and we regard the article in question as an extremely able contribution to local ornithology. —Ed. *F. N. Q.*]

Rutland Birds.—"I trust you will permit me a reply to Mr. W. Gyngell's comments on my article respecting the birds of this county. As far as I can follow his somewhat incoherent paragraphs, he sneers at the style and impugns the accuracy of my remarks. No one can answer a sneer, and style is a matter of literary taste. This is shown by those astonishing persons who believe that the plays of Shakespeare were by the same hand as the works of Bacon—a conclusion truly '*insupportable*,' to use the remarkable phraseology of our critic.

"With respect to the accuracy of what I have written, I can only affirm the truth of my statements, which are based on personal observation and investigation during twelve years. Goldfinches were scarce here twelve years ago, but have become more common. Mr. Gyngell's sarcastic reference to goldfinches in the good old times, as it happens, admits of an answer. Cobbett, in his *Rural Rides* (ii. 133), says: 'Between Somerford and Ocksey I saw on the side of the road more goldfinches than I had ever seen together; I think fifty times as many as I had ever seen at one time in my life. . . . The goldfinches were here in flocks and . . . I do believe I had at last a flock of ten thousand flying before me.' Who nowadays ever sees a flock of even two hundred?

"A common bird like the linnet has, of course, nothing to fear from the scientific egg-collector and bird shooter. Were it only as rare a bird as the Dartford warbler, the ornithologist who loves British birds in cases and their eggs in cabinets would swoop down on its few remaining habitats, and bribe the local gamekeeper and poacher to exterminate the race. See the evidence of W. H. Hudson on this point.

"The Corvidæ in this district are much too numerous, as every lover of birds here knows. This is what a clergyman in the neighbourhood writes to me under date 23rd July 1903: 'I have been reading your notes on the birds of Rutland, and I feel I must thank you for an effort to help in protecting our birds. The methods advocated by many persons also induce me to try and instruct them, from my own observation, how very wrong they frequently are. . . . I read in the *Daily Mail* an article on the decline in numbers of our rare birds, and I was astonished to find the main reason given was the destruction of birds of prey, the magpie being specially grieved over. . . . Magpies are the ruthless destroyers of our rare small birds. They take them from the nests just before the feathers begin to come. . . . I had a partridge's nest in some ground ivy near our front door—16 eggs; 15 hatched, and the bird took them off up the field at the back. Immediately a crowd of magpies collected round the wretched brood, and I have seen no partridge chicks since. . . . Only one nest has escaped in my garden this year (sparrows, starlings, and swallows excepted). . . . I must give the boys their due here, as I find they seldom take a nest. . . . My young cuckoo fell a victim to the magpies.' I suppose I needn't at this time of day frame an indictment against the 'carrion crow,' and no one can deny that the jackdaw and rook are much commoner *here* than their services to mankind would justify. Hear Lord Lilford on the 'carrion crow': 'We have not a word to say in defence of the "carrion crow." His habits appear to us to be purely noxious, and neither his personal appearance, voice, nor manners in captivity offer anything in extenuation of his evil propensities.' Again, on the grey or hooded crow : 'We have no plea to urge in defence of the grey crow, and hold him as a sturdy vagrant to be summarily dealt with at all times and in all places.' Again, on the rook : 'We cannot defend our friends from the charges brought against them, with perfect truth, by farmers and gamekeepers of the damage done by their taste for corn, both in grain and blade, and for eggs fresh and incubated. . . . Our partridges especially owe their safety to the abundance of vegetation, and not to any lack of searching on the part of the rooks . . . oophagous rascals. . . . We annually lose great numbers of the eggs laid by the pinioned ducks from the raids of these black robbers, who will even penetrate into the nesting hutches, and fly off with the eggs in their beaks. . . . In such a rook-haunted neighbourhood as ours it is certainly absolutely necessary to keep down their numbers.' On the jackdaw : 'This amusing but most pernicious bird . . . we found it absolutely necessary to wage war upon them in the interests of our garden, poultry, and game, to say nothing of those of the barn owl. . . . The daws not only carried off numbers of young chickens, pheasants, and partridges, . . . but in several instances, to our knowledge, took possession of the owls' nests, destroyed their eggs, and piled up their own nests in the cavities.' The jackdaw disputes the palm for noisy and obtrusive impudence with the house-sparrow, and does not, to our knowledge, compensate us in any way for his misdoings.

"The beauty of the jay and his sprightly ways may cause voices to be raised in their favour, and the jay is a favourite bird of mine ; but their evil propensities are hit off in one sentence by Lord Lilford : 'We have found that more than one of these birds in our possession preferred the eggs of small birds to any other food.'

"Lord Lilford's evidence is the more to the point in that Lilford is close to the borders of Rutland, and the conditions of bird life are similar here and there.

"The cheap sneer about the chough does not require an answer. It is obvious that this bird could not have been referred to. No doubt it has suffered from the rapacity of collectors. The remark about boiling its eggs I do not follow.

"The exponent of the 'sacredness of scientific accuracy' should be himself above the reach of criticism, but his article on "Common Birds" has several disputable statements in it.

"1. The note of the sparrow is not like 'chur-chur.'

"2. The robin's plumage is more olive than greyish brown.

"3. The sand-martin is mouse-coloured, not brown.

"4. The flycatcher does not frequent large trees, as the words seem to imply.

"5. The willow-wren does not haunt the upper branches of trees.

"6. I have never seen an oven shaped like a long-tailed tit's nest." —REGINALD HAINES, Uppingham.

[Any further correspondence on this topic must be restricted strictly to the zoology of the subject.—ED. *F. N. Q.*]

Viper Incident.—"Whilst walking across Horsey Warren, Norfolk, on 27th August ult., with several other members of the Sea Breach Commission, my attention was suddenly attracted by one of our party jumping up into the air with uplifted arms, and simultaneously calling out, 'A snake, a snake!' I immediately hurried up and searched for that snake, and soon discovered a large female viper coiled round upon herself, with her head ready to strike. I settled her with my walking-stick, and subsequently measured her 24 inches. On dissection I found that she contained nine young vipers, the largest measuring 6¾ inches; and, although they were not near enough to a natural birth to have absorbed the yolk-sac, one or two of them struck at my knife, so much so that several cautions were addressed to me by the onlookers. A curious coincidence was that the attacked party was the only man with us who was wearing knickerbockers; but whether the viper did, as he averred, coil round his leg,—he shaking her off and receiving no hurt,—or whether, as is more probable, his fright upon setting his foot down in close proximity to her extended body made his imagination jump, I must leave. Anyhow, I myself was fortunate enough to be bitten on the hand by a wasp last week without being stung!"—MAURICE C. H. BIRD, Brunstead Rectory, Stalham.

Answers to Correspondents.

W. S., Pontrilas.

Thanks for the enclosures. We are unable to see in them any evidence whatever for the belief in the doctrine of Maternal Impressions, which, so far from being accepted by the majority of scientific men, has, as far as we know, never been received by anyone who could justly be placed in such a category. We are speaking, of course, of the present generation. A very elementary knowledge of physiology and embryology is sufficient to negative the idea, which, like many others, has derived its popularity from ancient superstition and a certain number of coincidences. A mother sees a mutilated or malformed man, and it happens that she brings forth a malformed child. But every woman sees malformations during pregnancy, and very few have malformed children. The children of women engaged in nursing and surgery are not peculiarly liable to malformations. When an instance does occur of a malformed child, the neighbours set to work to try and account for it, and, of course, soon discover that the mother saw something or other at some time or another, which is quite sufficient. All experiments which have been made to endeavour to influence the offspring through the maternal impression at the time of conception have utterly failed. The idea that a mental impression on the part of the mother can be transformed into a physical deformity in the offspring is unthinkable, and has no scientific basis.

G. BLUNDELL, Wellington College.

The sand lizard (*Lacerta agilis*) is distinguished from the common viviparous lizard (*L. vivipara*) by the following characteristics :—The sand lizard is oviparous, it has two small posterior nasal scales bounding the nostril behind, and teeth on the palate. The common lizard is viviparous, it has only one posterior nasal scale, and no palatine teeth. The colouring is also somewhat characteristic. The green lizard (*L. viridis*) is often green or bluish green, lighter beneath, more or less marbled with black, sometimes having white spots, or one or two white streaks on the sides. The sand lizard is brown above, with black spots, green on the sides, whitish underneath. The viviparous lizard is olive above, with a white-edged blackish streak on each side and a central black streak ; the ventral surface is orange and blue (in summer), spotted with black. (F. J. Parker's *Zootomy*, p. 156.) See illustrations in last *F. N. Q.*

C. W. G. BROMLEY, Kent.

Many thanks for your record of the ring-snake (*T. natrix*) having been captured and a mole found in the gullet. The observation is of interest, inasmuch as this species has been supposed by high authorities never to feed upon birds or mammals. Several cases are now on record, however, of both birds and mammals being swallowed by this snake.

G. A. H., Westmoreland.

The harvest mouse (*Mus minutus*), the smallest of the family, is widely distributed over the southern counties, rarer in the Midlands, and practically absent from the lake country. In Scotland it is very rare, and in Ireland all but unknown, though it has been reported from time to time. (*British Vertebrates*, p. 74. Aflalo.)

F. P. T., Monmouth.

The hawfinch breeds in the counties round London, less frequently farther north, and never, so it is said, in Wales, Scotland, or Ireland, in all of which it occurs in winter only. It is, however, not uncommon in North Monmouthshire in spring and summer, and may breed there. Eggs, five, greenish, with black spots and lines.

R. H., Sussex.

The grey mullet has been held by some authorities to spawn twice in the year. It wanders up some of our rivers, *e.g.* the Arun in Sussex. It has no teeth. (*British Vertebrates*, p. 373. Aflalo.)

R. I. S., Worcester.

The stoat has, as a rule, five or six young ones, born in the spring. Rarely there are eight in a litter, and Mr. E. Blagg once took as many as ten. Its distribution extends to the Hebrides.

R. E. W., Perth.

Paramœcium may be obtained with certainty in an infusion of hay, or from water which has flowers in it for some days. See article on the "Protozoa" in our last issue.

Notices.

To Contributors and Correspondents.

All articles and other communications (typewritten if possible) intended for publication, and all books, Transactions, papers, etc., for review or other notice, should be sent to the Editor, *Field Naturalist's Quarterly*, 17 Hartington Place, Edinburgh.

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The Natural History of Animals. Half-vols. iii., iv., and v. By Professor J. R. Ainsworth Davis. Gresham Publishing Co. Price 7s. each.

Agriculture for Beginners. By C. W. Burkett. Ginn & Co. Price 3s. 6d.

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Animal Life and the World of Nature. Vol. i. Hutchinson & Co. Price 10s. 6d.

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Heredity in Disease. By G. Archdall Reid, M.B.

Shambles of Science. By L. Lind-af-Hageby and L. K. Schartan. London : Ernest Bell. Price 1s. 6d.

The Present Evolution of Man. By Archdall Reid. M.B. London : Fisher Unwin.

Handbook of the British Association Meeting at Southport.

A Treatise on Zoology. Edited by E. Ray Lancaster. Part I. Introduction and Protozoa. London : A. & C. Black. Price 15s. net.

The Naturalist—September, October, November.

Yorkshire Weekly Post (3 numbers).

Nature Study—September, October, November.

Knowledge—September, October, November.

The Lancet (three numbers).

An Introduction to Nature Study. By E. Stenhouse. London : Macmillan & Co.

The Naturalist in La Plata. By W. H. Hudson. London : Dent. Price 5s. net.

**School Hygiene.* London : Swan Sonnenschein.

The Humane Review.

**Advanced Hygiene.* University Tutorial Press. London : W. B. Clive. Price 3s. 6d.

**Wild Nature's Ways.* By R. Kearton. London : Cassell. Price 10s. 6d.

**A Little Brother to the Bear.* By W. Long. London : Ginn & Co. Price 7s. 6d.

**Place-Names of Scotland.* By J. B. Johnston. Edinburgh : David Douglas. Price 6s. net.

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* To be reviewed in our next.

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